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Eastman Dental Clinic in London
Full Time Dental Supervisors

BUREAU OF CHEMISTRY

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DENTAL HEALTH EDUCATION

Indianapolis Free Dental Clinic

THIRTY-FIVE CENTS

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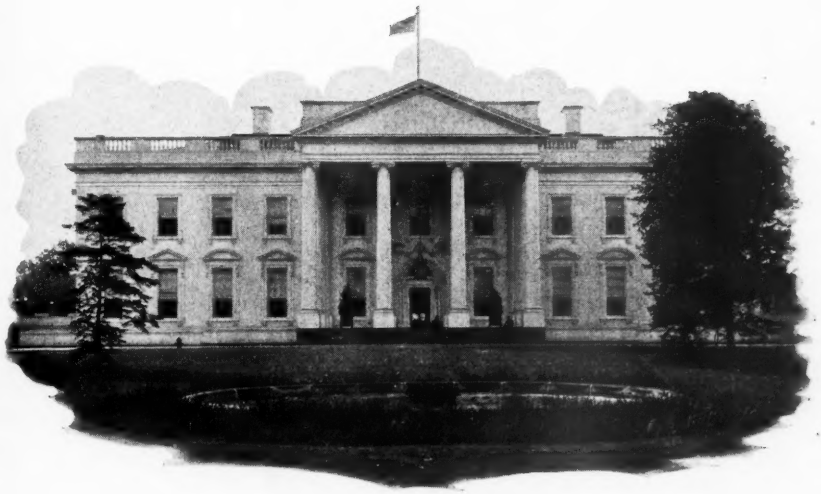

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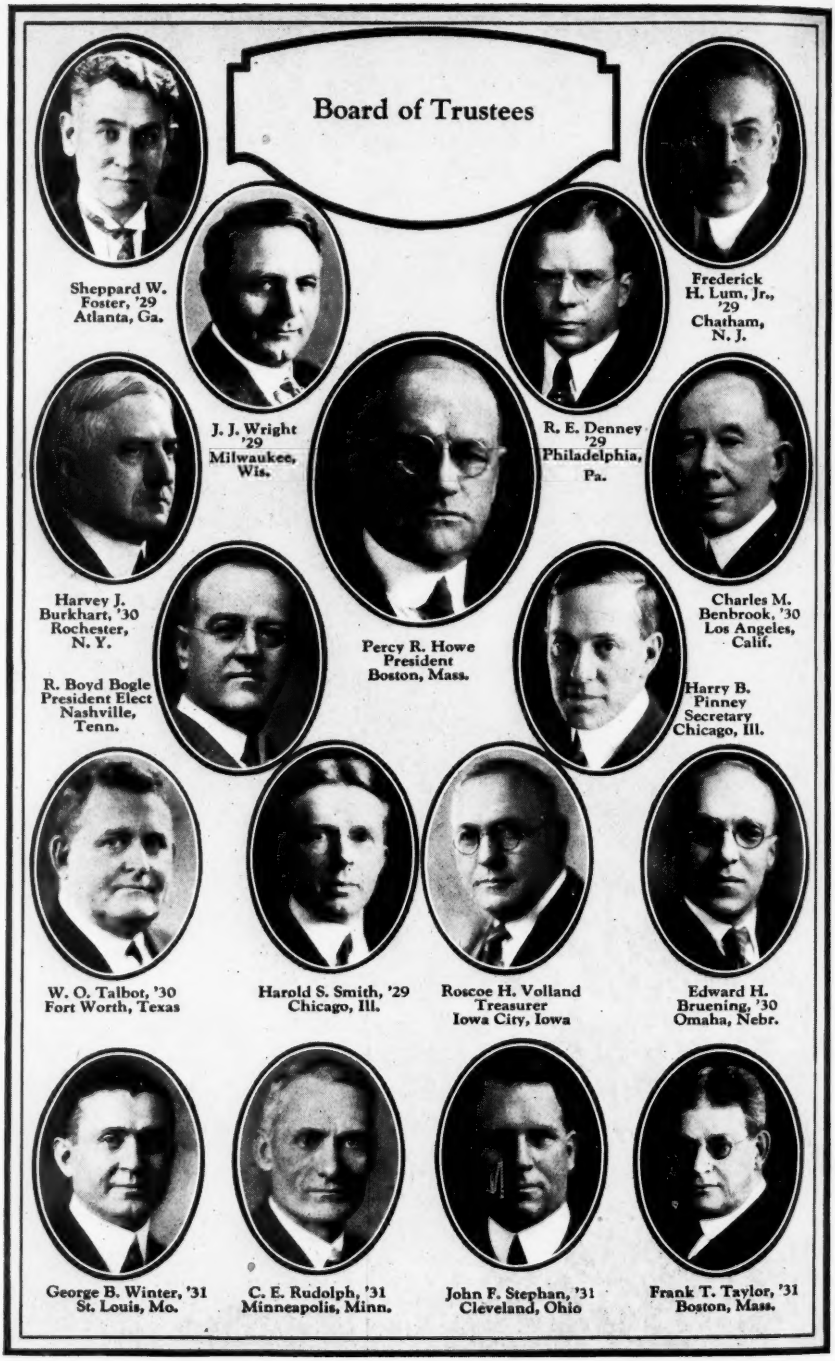
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Original Communications

PRECANCEROUS LESIONS OF THE ORAL CAVITY

By JOSEPH COLT BLOODGOOD, M.D., Baltimore, Md.

IT is important for every member of the medical and dental professions to be familiar with oral lesions, because, when present, these lesions may be the beginning of a possible cancer of the oral cavity. Proper treatment at this stage always accomplishes a cure. The dentist pays too much attention to the teeth; the nose and throat specialist's vision begins posterior to the anterior pillar of the fauces. The old practitioner was interested chiefly in a coated, dry or moist tongue; the blue line of lead poisoning along the gums, or the cyanotic appearance of patients with cardiac disease. For years, when surgeons examined the mouth, they found cancer in its last stages. It is remarkable for how many years leukoplakia excited little attention until cancer developed. It is only since the World War that we really have become familiar with Vincent's infection, the most common cause of a sore mouth. Ulcers, warts, hypertrophied papillae at the base of the tongue, fibromas, adenomas of the labial glands, angiomas have excited no interest of patient or physician until the lesions have become malignant or large. In older literature, there are more references to "geographic tongue," which has no relation to malignancy, than to leukoplakia, which is the chief predecessor of cancer. Ranula, a form of cyst in the floor of the mouth, which is not only a rare, but also an innocent lesion, is described in its three forms in all textbooks of surgery.

Twenty-five years ago, the most common examination question concerned ranulas. The possible relation of a loose tooth, abscess or epulis to the beginning of a malignant tumor of the jaw has been recognized only very recently, although that such a relationship exists I find it recorded as an uninterpreted fact in all the histories of malignant lesions of the upper and lower jaw and oral cavity, since the first history in the Johns Hopkins Hospital in 1889. Teeth are extracted, abscesses incised, swellings around the alveolar border incised or neglected without any one giving the least thought to the possibility that these are signs of malignancy in its earliest

stages. The roentgen ray is becoming firmly established as an instrument of precision. Yet, many teeth are extracted without a diagnostic roentgen-ray film. Frozen sections for diagnosis at the time of the operation for lesions of the mouth are made in but few clinics of the world. Yet, the roentgen ray and the frozen section apparatus are essential instruments of precision for the proper diagnosis of lesions of the oral cavity, allowing cancer to be recognized in its earliest stages,

Fig. 1.—Leukoplakia.

and directing the treatment of all lesions of the oral cavity so that cures may be accomplished with the least mutilation. Salesmanship as regards the diathermy and coagulation cautery has been far better than that for the frozen section apparatus, and many clinics are provided with this expensive instrument, which, without doubt, is one of the best means of attack, when they are not provided with a frozen section outfit, the real compass for the direction of the attack.

Physicians and dentists should become familiar with the ordinary appearance and the feeling on palpation of leukoplakia, Vincent's infection, fibroma, wart, papilloma and various types of ulcers, tuberculous, syphilitic, cancerous, and with other areas of irritation, subcutaneous nodules, cysts and adenomas, the different types of epulides, stomatitis, glossitis, fissured tongue, bulging teeth, the normal and hypertrophied papillae of the tongue, the normal and diseased appearance of the labial glands of the cheek and the changes in the appearance of the gum in pyorrhea. These are the common lesions of the oral cavity. Abscess, looseness of teeth and swelling of the alveolar border and of the upper and lower jaw can be detected with the finger, but must be interpreted from the roentgenogram or on exploratory incision with a frozen section.

LEUKOPLAKIA

The patient sees the white patch of leukoplakia, but does not feel it. Every dentist should early become familiar with this callosity of the mucous membrane of the oral cavity, which is like a scale of white enamel paint on the moist, red mucous membrane of the mouth. Leukoplakia, with the rarest exceptions, is seen only in the mouths of those who use tobacco in some form, including snuff. As a rule, in these cases, the teeth are ragged and dirty. The great majority of patches of leukoplakia occur where the teeth come in contact with the tongue, lip or cheek, or where the chewing tobacco or snuff rests in the mouth. Now and then, a patch of leukoplakia can be produced by the irritation of a tooth, especially one with a metallic filling. In about one out of 200 cases diagnosed as leukoplakia, the condition is pseudoleukoplakia, a rare disease of the oral cavity, very difficult

to distinguish from leukoplakia, except by its onset at an early age, and the fact that, as a rule, the use of tobacco and the presence of bad teeth are not factors. We will not eradicate cancer from the human race until doctor and patient realize that the cause of leukoplakia is the use of tobacco, and the only treatment is to stop its use in all forms, and to clean and smooth the teeth. The majority of individuals can smoke in moderation with little danger of leukoplakia, if they practice daily oral hygiene and see a good dentist at frequent intervals.

VINCENT'S INFECTION

Next to the presence of ragged, dirty teeth and the use of tobacco in excess, the most common cause of sore mouth is the infection with the typical spirillum of Vincent. The characteristic clinical picture is a red area, as a rule with a central gray opaque zone. It could be easily called erysipelas of the mouth. It is never found in the edentulous, and the organism apparently lives in pockets about the teeth. It may extend to the lip, and produce a fever blister; or to the cheek or the tongue, or even to the tonsil and pharynx. In a few instances, there may be a single ulcer or multiple ulcers. The mottled red area, with the central whitish or grayish patch or zone, may be single, multiple or diffuse. When it covers the tonsils or pharynx, it may suggest, in appearance only, diphtheria. But such patients never suffer from sepsis as in diphtheria. In every instance, cover slips showing the typical spirillum will afford a diagnosis. Patients with Vincent's infection suffer from soreness of the mouth in addition to what can be seen there. Patients with leukoplakia alone have little or no soreness. Vincent's infection may be present and complicate every benign and malignant lesion of the oral cavity. In many instances, it is the only lesion. This infection itself is quickly cured by cleanliness. The best drug in this condition is sodium perborate. Once a day, the patient takes in the hollow of the left hand a teaspoonful of sodium perborate, places it in the mouth dry, lets the saliva make a paste, rinses the mouth for five minutes, brushes the teeth with this paste and rinses the mouth with warm water. In addition, the teeth should be cleaned with the ordinary tooth paste, before and especially after eating, and the mouth rinsed with some alkaline mouth wash, liquor antiseptic us or some form of glycothymol solution. I have found it easy to teach patients to use mercurochrome at bed time. With a swab of toothpick and cotton dipped in mercurochrome, the gums are painted around all the teeth, most attention being given where the gums are receding or there are pockets. The saliva is allowed to dilute the mercurochrome, which is held in the mouth for five minutes, after which the mouth is rinsed with warm water until the mercurochrome has disappeared. The only

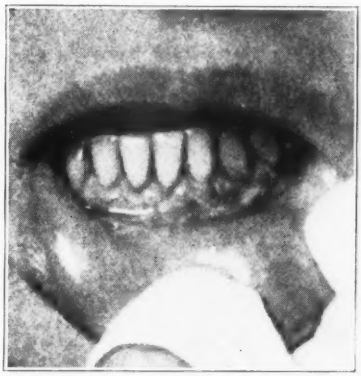

Fig. 2.—Vincent's infection of the gum.

objection to mercurochrome is that it stains, but with patience, the proper technic for using it can be learned. For the first treatment of most cases of Vincent's infection, the dentist should thoroughly clean the teeth, filling every cavity, cleansing every pocket, taking a roentgen-ray film and extracting every tooth with a root abscess, replacing bridgework that cannot be kept clean with removable plates and teaching the patient the technic for continuing the treatment. Patients should report at frequent intervals until the disease is eradicated. There is no relation between the Vincent's infection and cancer. When an ordinary case of Vincent's resists treatment, look for infected tonsils, some nasosinus disease or adenoids, some general disease such as Banti's (splenic anemia) or general leukemia, a vitamin deficiency disease of the type of scurvy, deficiency in some internal secretion or achylia. In about 5 per cent of cases of Vincent's infection

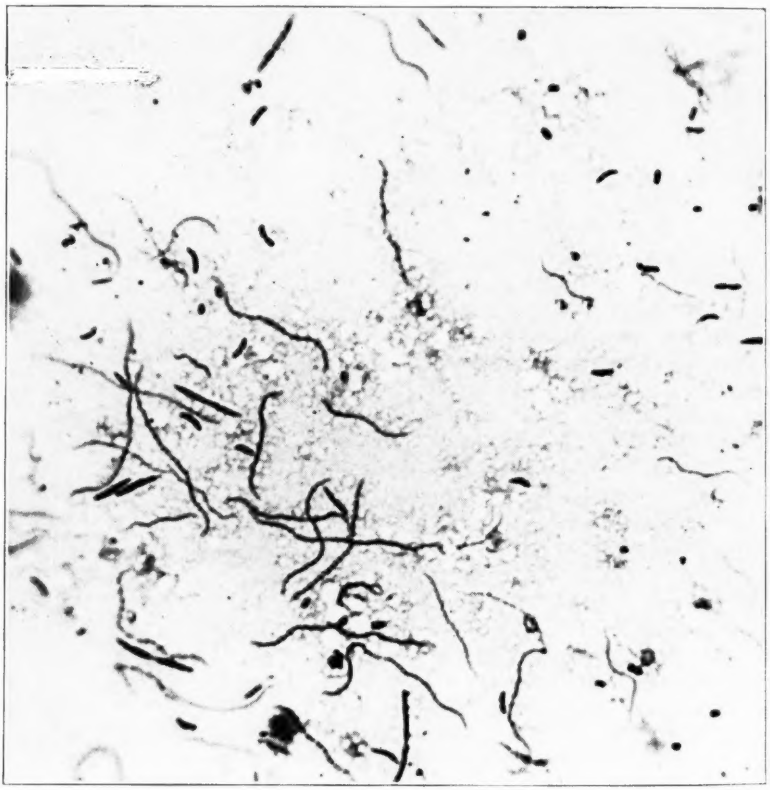

Fig. 3.—Vincent's infection (microscopic section).

which resist treatment, an additional cause is ultimately found. I have never seen Vincent's infection in a virulent form, although I have seen it diffusely affecting the oral cavity, fauces and nasopharynx.

Dentists can quickly teach themselves to recognize the spirillum readily in the cover slip under the microscope. One of the most frequently overlooked factors is concealed pockets in the gums about the teeth and small painless cavities beneath bridgework and gold fillings.

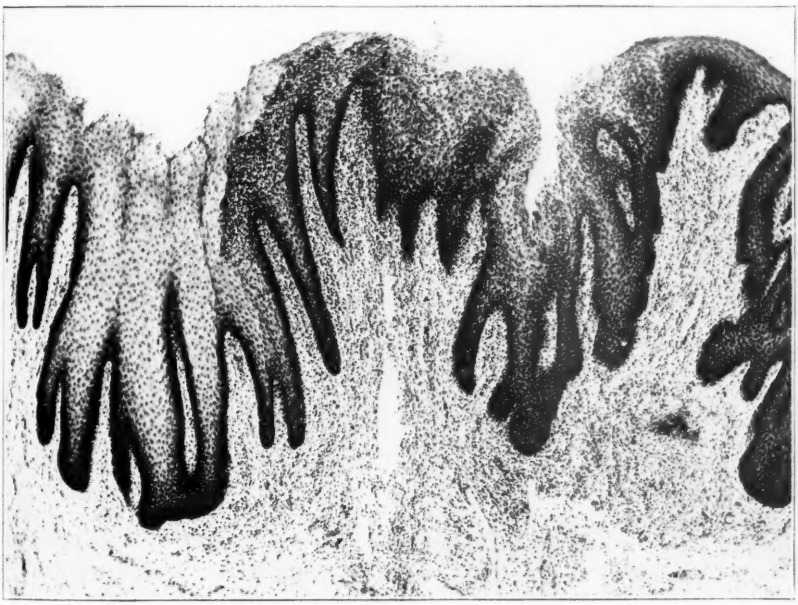

Fig. 4.—Hypertrophied papillae at the base of the tongue.

AREA OF IRRITATION

The patient may complain of a sore spot on the tip or the side of the tongue, on the lip or the cheek or on the gum, as a rule where the tooth comes in contact with the mucous membrane; or the sore spot may be partially or completely beneath a plate. The sensations that the patient complains of vary. The pain may be sharp, stinging or dull. Talking may increase the discomfort; highly seasoned food may make it worse. Sometimes, nothing can be seen in this area of irritation. Sometimes it is a little red. In a number of these cases, Vincent's infection is found in addition to an irritating tooth or an ill-fitting plate. These patients are almost immediately relieved by removal of the cause. But when the patient has the fear of cancer, the symptoms are exaggerated and the area of irritation does not disappear even when tobacco, teeth, plate and spirillum are removed. In this group, the fear of cancer

is perhaps more marked than in any other group, and for this reason, these patients need special psychic treatment, as they will not be relieved of the local condition until the fear is overcome. The more we talk on the danger of cancer of the mouth, the more we tell people that a sore spot or a white patch may be the beginning of cancer, the more frequently are we to see areas of irritation arousing the fear of cancer. Yet when these patients are properly examined and properly advised, and all the possible factors of irritation are removed, both areas of irritation—in the mouth and in the mind

Fig. 5.—Fibroma of the tongue.

—promptly disappear.

I wish to call special attention to the most marked area of irritation. The condition is due to the pressure of an ill-fitting plate and the red area of mucous membrane is distinctly outlined. The plate should be removed at once and never replaced until the irritation has completely disappeared, and then there must be a new plate.

AREA OF IRRITATION DUE TO RADIUM

There is no question that people are being very well educated, and they are coming to individuals and to clinics with lesions of the mucous membrane in the earliest stages. Unfortunately, radium is being widely distributed, and when radium is in the hands of one who cannot recognize leukoplakia, Vincent's infection, areas of irritation and hypertrophied papillae, patients are likely to be given radium instead of having the cause removed. In the past two years, I have seen a number of what may be called areas of radium irritation, the first stage of a radium burn. The original lesion had always been benign and the resultant one worse than the original. The red area of the radium burn resembles the red area resulting from pressure from an ill-fitting plate, except, at the line of demarcation, there is a narrow red line and, beyond this, a zone of mucous membrane covered with a gray exudate. This is not unlike the typical picture of a gumma, except that, in gumma, the central area of irritation is yellow. These radium burns take months to heal. The most soothing treatment is frequent gargling with a solution of sodium bicarbonate and, twice daily, painting the spot with mercurochrome. The radium treatment may cause the localized lesion to disappear, but it has no effect on the general leukoplakia, and we must remember that when a smoker has leukoplakia, it is more important to get rid of the tobacco than of the leukoplakia. If we get rid of the tobacco, we remove the cause of cancer.

The indication for any treatment of the leukoplakia is the presence of a cracking, scaling wart, or ulcer. Then it is safer to burn the area out than to treat it with radium.

HYPERTROPHIED PAPILLAE OF THE TONGUE

For practical purposes, irritation at the base of the tongue where the papillae

are most marked is called hypertrophy of the papillae. When the average patient sticks out his tongue, the average physician does not see the papillary area; therefore, most physicians are not familiar with the normal appearance of the papillae at the base of the tongue. Given a correctly informed adult, man or woman, who suddenly has a sensation of soreness at the base of the tongue and then goes to the physician, who for the first time sees a patch of red hypertrophied papillae, and who does not take a smear for Vincent's infection; who does not observe the molar teeth opposite this area covered with tartar, or who fails to look for infected tonsils or pus dripping from the nasopharynx, or to observe the other evidence of excessive use of tobacco, and this patient, in the early years of our educational efforts, had a piece cut out for microscopic diagnosis, while now he gets radium treatment without any diagnosis, and then there is a radium burn. I have a number of such cases. Fortunately, the number of cases in which there has been no treatment is the largest, and as cancer and syphilis frequently have their primary lesion at the base of the tongue in this area of papillae, one must make the differential diagnosis. In the first place, in order to get a better view, we must pull the tongue out with a bit of gauze, retract the cheek and examine the area with the cold Cameron light. One can always see ulceration which is never present in an area of irritation and hypertrophied papillae of the tongue. Palpate the area with the finger for the indurated area of cancer or tuberculosis. Exclude infected tonsils and nasosinus infection. Make cover slips for Vincent's infection. If the spirillum is present, start treatment. Clean and smooth the teeth; stop all tobacco while the investigation is going on; remove all possible causes. Allay the fear of cancer. Make a blood Wassermann test and give arsphenamin when this is positive. Make a physical examination and look at the roentgenogram for signs of tuberculosis. When all possible factors are removed, we can begin to think of splitting the cheek and excising the area for frozen section. But this is rarely necessary. Now and then, in a primary syphilitic lesion or an early tuberculous infection, a biopsy may be necessary to differentiate the condition from cancer, but a biopsy with frozen section, to be followed at once by the complete local removal, if the section shows cancer. I have had one syphilitic lesion at the base of the tongue which I could not differentiate from cancer. It had passed the stage of hypertrophied papillae. The Wassermann reaction was positive. It was my opinion that it was safer to make

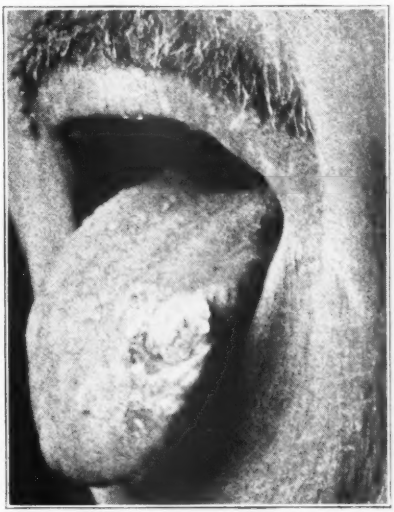

Fig. 6.—Wart in leukoplakia area.

a biopsy. The patient, however, took the risk and chose to take arsphenamin. In three weeks, the lesion had disappeared. Had it been cancer, he might have lost his life.

HYPERTROPHY OF LABIAL GLANDS IN THE MUCOUS MEMBRANE OF THE ORAL CAVITY

The cysts and adenoma of the mucous glands, especially of the lower lip, were known even before we had educated the public to come in at once if they observed a white patch, a sore spot or a nodule in the mouth, and it is more than ten years since I published an article on keloid

Fig. 7.—Benign wart in leukoplakia area after excision.

tumors of the lower lip. But only in recent years have I seen many examples of an exaggerated appearance of these glands throughout the mucous membrane of the mouth, especially on the cheek. These cases are dramatic evidence that people are getting information and that the dental and medical professions are looking at the mouth more critically. In their first impression, they think that they are observing things which they have never seen before. Perhaps they have never seen these conditions before, but they overlooked them because the vision of both professions was taken up with a fully developed local lesion, usually cancer. In many mouths, the little glands are visible beneath the red mucous membrane as dots and oblong sausage-shaped yellow and grayish white areas. They cannot be felt, but are seen shining through the transparent epidermal layer of the mucous membrane. They remind me of the lacteals that one now and then sees shining through the wall of the small intestine near the mesentery when the abdomen is opened, usually for stab or gunshot wounds, within two or three hours after a full meal. These visible submucous glands of the oral cavity are not pathologic, but they must be borne in mind and differentiated from leukoplakia, Vincent's infection and areas of irritation. I know they have no relation to cancer: I have yet to find their diagnostic significance.

STOMATITIS

A diffuse inflammation of the mucous membrane of the mouth always accompanies the diffuse form of Vincent's infection, but the typical local lesion of this infection is readily seen in the inflamed mucous membrane. In the worst forms of diffuse leukoplakia, associated with ragged, dirty teeth, in addition to the diffuse white appearance of the mucous membrane, there may be areas of redness and even an exudate. In most of these cases, the secondary stomatitis is associated with Vincent's infection.

Now and then, we see diffuse stomatitis when there is no element such as tobacco usage, in extensive pyorrhea, usually associated with root abscesses. This type never heals until the teeth are extracted. Infected tonsils and the dripping of pus from a nasosinus infection in the posterior nares may produce this type

of stomatitis in which neither tobacco usage nor Vincent's infection is present as the causative agent. The stomatitis that has no relation to tobacco and is not associated with Vincent's infection is very slow in its spontaneous recovery after the causative factors are removed, and these patients, should they have a fear of cancer, may become chronic invalids or neurasthenics, because of the persistent symptoms: soreness, redness and whitish areas after the extraction of the infected teeth or the removal of the tonsils, the drainage of the sinuses or the straightening of the septum.

This septic form of stomatitis present in the user of tobacco is often diagnosed leukoplakia, because white patches due to exudate are often present. These cases do not heal. They are not even much improved when tobacco is discontinued, and are often cited as examples of leukoplakia having no relation to tobacco.

When Vincent's infection is treated without bacteriologic evidence, this form of stomatitis is not relieved, and even when the cover slips show the spirilla, the specific treatment for Vincent's infection does not give the usual immediate relief, because the factors of infection in root abscesses, tonsils or sinuses are still present. I am seeing more and more of this group. Such cases demonstrate that, in addition to a survey of the oral cavity which includes roentgen-ray films of the teeth and cover-slip examination, there must be a thorough inspection of the tonsils, nasopharynx and sinuses. The dentist needs the nose and throat specialist, and the latter needs the dentist. Both should be able to make the complete survey.

GLOSSITIS

A diffuse thickening and enlargement of the tongue has been observed, chiefly with leukoplakia, with and without cancer, in which the blood Wassermann reaction was positive, and in tuberculosis of the tongue in which the Wassermann reaction was negative. In passing, it is interesting to note that cancer of the tongue, no matter how small, in diffuse glossitis with a positive Wassermann reaction, is almost surely fatal. My records show this from the very beginning; nor have I been able to find any improvement since the introduction of radium and the roentgen rays, including buried radium needles and emanations, with or without surgery.

Fig. 8.—Benign ulcer due to ragged tooth.

FISSURED TONGUE

Unless due to the scar of a previous operation, fissures of the tongue are usually associated with stomatitis, especially syphilitic. I have not seen them in tuberculosis.

BULGING CHEEK

Cancer of the cheek is more common in the fat than in the thin, because the accumulation of fat in the cheek pushes the mucous membrane between the teeth, and if there is leukoplakia, with rough and ragged teeth, the opportunity for injury of the cheek is increased and, with

it, the opportunity for the development of cancer.

Fat people with this complication should be unusually careful of keeping the teeth clean and smooth.

FIBROMA

It is remarkable how often fibroma is diagnosed leukoplakia when the subepidermal fibrous nodule is covered with thin white, anemic mucous membrane, or cancer when the mucous membrane

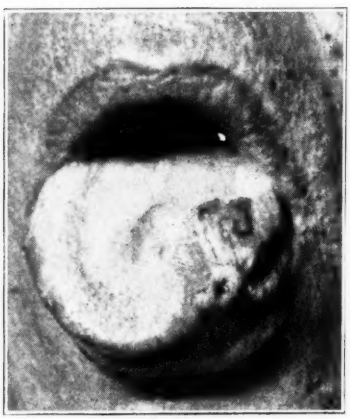

Fig. 9.—Tuberculous ulcer with induration like cancer.

over the white nodule has ulcerated, owing to the pressure of the nodule or injury from teeth or plate. These nodules vary in size from that of bird shot to that of a pea. The cause is the same as in a fibroma anywhere else—injury. Biting the tongue, cheek or lip is the most common factor. Therefore, fibromas are most commonly found in areas which can be bitten by the teeth. When they are observed elsewhere, the injury has been produced by the presence of a foreign body—a fishbone, a hypodermic needle used in a tonsil operation or a dental instrument.

In about 10 per cent of the cases of fibroma, cancer has developed. For this reason, if the lesion is in a spot subjected to the constant irritation of the teeth or a plate, it should be removed at once with a good margin. If anywhere else, there is no danger to wait a few months for possible spontaneous disappearance, which often takes place in keloid or fibroma.

WART

The fibroma is a mass of connective tissue beneath the mucous membrane; a wart is a mass of epithelial tissue on top of it. This area of epithelial hypertrophy is much more likely to develop into malignancy than the area of connective-tissue hyperplasia. The most common cause of a wart in the oral cavity is leukoplakia; but, now and then, the warty growth may develop at once from the irritation of a tooth or plate or from the burn of a cigar, cigaret or pipe without any evidence of leukoplakia. Warts should always be removed with a good margin, so that no matter what the microscope shows, a sufficient area has been removed. There is no way of telling whether the wart is malignant or not until the microscopic section is examined. Up to 1915, our records show few warts and few early cancers. We then began to observe more early cancers and a larger number of warts. Now the percentage of warts is greater than the percentage of cancer, and the two together are much more numerous than fully developed cancer. This means that we are on the road to cure cancer of the oral cavity.

ULCER

Whenever we see an ulcer, we should think of cancer. If the ulcer is in an

area of leukoplakia, we should not delay a minute, but should excise it with a good margin. If the ulcer, no matter how small, has an indurated edge, we should excise it, although it may be tuberculous or syphilitic, or a result of pressure or injury from a tooth. If it is an ulcer, it is dangerous to delay to see the effect of removing the cause. Even if the Wassermann reaction is positive, if the ulcer has an indurated edge, we must not delay. The ulcer rarely seen in Vincent's infection has no indurated edge and reacts almost immediately to treatment. It is usually associated with other minute ulcers so commonly observed in Vincent's infection of an extreme severity. In pyorrhea, there may be multiple superficial ulcers on the gum. But if there is a single ulcer, we should burn it out with the cautery, taking enough tissue for microscopic study. All these small ulcers of the mouth, no matter where they are situated, can be excised with a margin sufficient for cancer and, more important, sufficient for the cure of cancer, without mutilation, with far greater certainty of cure than from irradiation. The unfortunate thing is that these little ulcers are neglected, because so many at the onset are not cancer and so many heal when the cause is removed, with or without irradiation. But when I see fully developed cancer today, I usually get a history of a neglected ulcer. I am confident that, with few exceptions, the best treatment for ulcer is complete excision, and at once. When the ulcer is so large that its complete removal would be mutilating, there must be a biopsy, but there is not much chance of cure for a cancerous ulcer of the mouth the complete excision of which means mutilation.

TUBERCULOUS ULCER

As a rule, a tuberculous ulcer has no induration and has an excavated edge, but when it is small, it may have an indurated edge, and it should be excised like any other ulcer, whether the edge is indurated or not. As a rule, the tuberculous ulcer is larger, and when it is, it has a different edge and does not feel like cancer on palpation and there is evidence of tuberculosis in the lungs. With this ulcer, there may be stomatitis due to myositis around tubercles buried in the muscle. Sometimes, on account of induration, this is difficult to differentiate from cancer. Biopsy is always indicated, because the lesion is large. I have not yet observed cancer in tuberculosis of the tongue and oral cavity. Now and then, it occurs in tuberculosis of the skin (lupus vulgaris). The prognosis for tuberculosis of the mouth is good. There is practically always tuberculosis of the lungs, and the tongue is infected because of injury.

Fig. 10.—Geographic tongue.

SYPHILITIC ULCER

The primary lesions in syphilitic ulcer are usually on the mucous membrane of the lower lip. All I have seen have been

quite characteristic, with a positive Wassermann reaction and rapid healing, within ten days, after arsphenamin therapy. I have not seen mucous patches within the mouth for years, but the typical patch is not at all like cancer. I have noted one syphilitic area on the base of the tongue difficult to distinguish from cancer, and I have already called attention to the common association of cancer and syphilis of the tongue, stomatitis and gumma and its bad prognosis.

Our records show a definite and marked decrease in the number of cases with lesions within the mouth in which

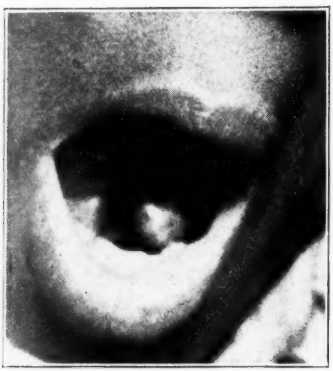

Fig. 11.—Ranula.

the blood Wassermann reaction is positive, and glossitis, undoubtedly the result of untreated syphilis, and gumma of the tongue have practically disappeared in the past ten years. Primary syphilitic lesions and mucous patches are becoming equally rare. Syphilis as a factor of cancer of the tongue, so prominent in the time of Butlin of London, is apparently under control in this country.

PELLAGRA

Fifteen years ago, when pellagra was common in the South, I observed a few cases of pellagra stomatitis. The lesion was diffuse and, of course, not difficult to distinguish from cancer. On one occasion only, there was referred to me from a southern state a man with glossitis with peculiar changes of the mucous membrane of the tongue. The lesion had come on while he was in the penitentiary. The appearance of the tongue suggested neither cancer nor tuberculosis. The Wassermann reaction was negative. The roentgen rays revealed no lesion of the lung. We did not find the spirilla of Vincent. The patient kept his teeth clean and did not use tobacco. While he was under observation, vesicles and similar lesions broke out on the lower lip. For this reason, we did not make a biopsy, but increased the intake of vitamins and essential foods. Rapid healing of the entire lesion followed. I have no example of cancer of the mouth developing on one of these lesions of the oral cavity that may be associated with this disease.

SCURVY

A discussion of scurvy may cover the entire subject of bleeding gums, in which scurvy is only one of the factors. The discussion comes under Vincent's infection. I have already mentioned that, in some cases of sore mouth with or without bleeding gums, in which the spirillum of Vincent may be present or may not, there may be other factors, and if this is the case, they must be found and removed before the lesion of the mouth will heal. Space forbids a discussion of this rare group.

LEUKEMIA

Now and then, in leukemia, the gums are so swollen that the teeth are almost buried. The upper and lower jaw and the tissue on both sides of the gum are involved. Microscopically, beneath the

epidermis, there is a diffuse growth of lymphoid cells giving the picture of lymphosarcoma. The examination of the blood confirms the diagnosis. This condition of the gums in leukemia, in my experience, has appeared only in a few cases and a short time before death.

SUBCUTANEOUS BENIGN TUMORS

Practically everything that we have discussed so far, except hypertrophy of the labial glands and fibroma, are lesions of the epidermal zone of the mucous membrane. Subcutaneous tumors here are rare and, as a rule, not difficult to diagnose nor to remove completely, unless they are too large. The diffuse hemangioma and lymphangioma of the mucous membrane of the cheek, floor of the mouth and tongue may be so large at birth that one would wish to try irradiation first. My experience favors complete excision of these angiomatous tumors if it can be done without mutilation. In the latter event, irradiation should be tried, and if this fails, coagulation. These tumors are rare.

When a subcutaneous tumor reaches the size of a pea, it is safer to remove it. There is no way of distinguishing the fibroma from the adenoma or the dermoid cyst. In a number of instances of malignant tumors, both cancer and sarcoma, the patients have been aware of the presence of a small subcutaneous tumor for years. The most common situation of these subcutaneous tumors is on the lower lip, and it is best to leave them alone unless they get larger than a pea, as they often disappear with or without spontaneous rupture. When the size or the presence of irritation demands removal, a good margin is given and the specimen is studied microscopically, because, as stated before, keloids may develop in the scar and suggest malignant recurrence.

RANULA AND THE SUBLINGUAL SALIVARY GLANDS

One should be familiar with the region of the mouth occupied by the sublingual salivary glands. On each side of the anterior third of the tongue, one can see and feel, beneath the mucous membrane, sublingual salivary glands, and, on each side of the middle raphé, one may observe the papillae through which these and the submaxillary salivary gland ducts empty.

One week ago, one of my students sent me a Princeton student who complained of pain, tenderness and bleeding about the papillae of the floor of the mouth on the right side. Nothing could be made out on palpation, and there was no calculous and no spirilla of Vincent. The patient was given an antiseptic wash and the lesion disappeared in a few days. The condition was not unlike bleeding from the nipple of the female breast, and it is possible that there may be a papilloma in the duct too small to be felt. It may disappear or may later give rise to a tumor of the salivary glands of a type that I have never seen before.

Calculi of the sublingual and submaxillary glands are not at all difficult to recognize on palpation or in the roentgenogram and are easily removed through the mouth. Ranula is a distinct submucous cystic tumor varying in size. There should be no difficulty in distinguishing it from sarcoma and cancer.

I shall not discuss the mixed tumors of the parotid gland. Their common situation is in the neck near the angle of the jaw, but they may occur in the cheek, hard palate, tonsil or sublingual region, as well as in the submaxillary region. They are distinctly palpable

tumors. They cannot always be differentiated from beginning sarcoma or benign tumors of various types. They can be easily and properly removed without mutilation.

RARE LESIONS OF THE ORAL CAVITY

In the first twenty-five years of my experience with lesions of the oral cavity, the common lesion was cancer. Today, the lesions which I have just described are much more frequent than cancer. In fact, the nonmalignant lesions of the oral cavity have increased in my experience from 3 to 65 per cent. Something new that is not malignant is coming under observation every month. At a clinic which I gave in Farmville, Va., a few weeks ago, a boy of 19 had what at first appeared to be leukoplakia of the oral cavity, but which was too diffuse for leukoplakia. Against a diagnosis of leukoplakia was the fact that the condition had been present since birth, that the patient had never used tobacco and that most of the members of his family suffered from the same condition. I had no opportunity to go farther into the diagnosis. Bedford Shelmire gave, before the Section on Dermatology of the Southern Medical Association, a clear description[1] of what he terms certain diseases of the oral mucous membrane and vermilion borders of the lips. He speaks of them as nonsurgical conditions of the oral cavity. He mentions the raspberry tongue of scarlet fever; Koplik's spots of measles; the oral hemorrhages, ulcerations and infiltration of the various leukemias, and the glossitis of pernicious anemia (this I have never seen); the ulcerations of agranulocytic angina; the stomatitis of pellagra; the hemorrhages of scurvy; the pinhead white oral tubercle of miliary tuberculosis (this I have never observed), and the petechial hemorrhages of bacterial endocarditis. He then describes fully the stomatitis that may be produced by drugs: mercury (we have recently had such a case which extended to a diffuse periostitis with ultimate loss of all the teeth and some sequestra), arsphenamin, bismuth, the entire antipyrin group. In the past year, since we have been using intravenous lead for cancer, we have observed the blue line on the gum in most of the cases, but rarely stomatitis. This may have been prevented by our constant supervision of the oral condition as regards hygiene.

This demonstrates that, in stomatitis, we must look for a drug as the possible cause. I have not observed the peculiar dessication and herpes and erosions that Shelmire pictures as associated with the menstrual period. They may be very marked on the lip. Gingivitis gravidarum we do not often see now, because our patients are under good dental care. But one should be familiar with the oral lesions which are transitory during pregnancy. Shelmire describes well and illustrates clearly thrush, mycotic macroglossia and other lesions of the mouth due to fungi or yeast. I have only recently seen one such case, which at first was taken to be leukoplakia. Blastomycosis of the oral cavity I have not observed. I know of no article in recent literature that describes better these rare conditions of the oral mucous membrane. These lesions are diffuse and, as a rule, their differentiation from cancer gives no difficulty; but, in view of the common occurrence of leukoplakia and Vincent's infection, they may receive the routine treatment of the discontinuation of tobacco in all forms and the use of sodium perborate; when they may dis-

1. Shelmire, J. B.: South. M. J., 21:169 (March) 1921.

appoint both patient and physician by not rapidly responding.

CANCER

Those of us whose surgical experience goes back twenty-five years or more know what late cancer of the mouth means. It means a hopeless condition in more than 50 per cent of the cases and a chance of curing the disease in less than 20 per cent. Far better results were obtained on the lips than on the tongue; and in the gum and hard palate, far better results than in the cheek and soft palate. I have no evidence that in any of its forms, roentgen-ray irradiation has increased the number of cures. Irradiation offers palliation when surgery offers nothing but mutilation. Only the ignorant and uninformed should die of cancer of the mouth. When correct information in regard to the oral cavity is properly disseminated, dentists and physicians will be swamped with cases showing the types of lesions which I have just described, and cancer will then appear as an innocent local lesion in the way of a wart or an ulcer. Mouth lesions will then be in one of two groups. In the larger, the cause or causes will be found and removed, and the lesion will disappear. In the smaller, the local lesion having the character of a wart or ulcer will immediately be properly removed with the knife or cautery, in such a manner that, if the microscope shows beginning cancer, no further operation will be necessary.

THE HIGH LABIAL ARCH*

By LLOYD S. LOURIE, D.D.S., Chicago, Ill.

As the high labial arch is not a new appliance, considerable repetition may be expected in this paper but this may be justified, as some of its basic principles seem to be not generally understood.

What is the high labial arch? It is simply an ordinary expansion arch or base wire placed beyond the gum line instead of across the teeth, force being delivered to the teeth anteriorly to the anchor teeth by means of various forms of spring extensions and the base wire itself being used for movement of anchor teeth. It is absolutely essential that the comparative size and rigidity of the base wire be sufficient to prevent its displacement by the reaction of the spring extensions when they are delivering force to the teeth. The first use of the high labial arch was in connection with the lingual arch, and this combination was first publicly recommended as a retainer before the American Society of Orthodontists in 1914,[1] although I had successfully used it for tooth movement for several years before that time. Figure 1 shows an appliance used in 1911. The history of this early development has been recorded by Martin Dewey in three

*Read before the Section on Orthodontia at the Midwinter Clinic of the Chicago Dental Society, Jan. 14, 1929.

1. Lourie, L. S.: Clinic on Combination of Lingual and Labial Arches, Dent. Items Int., 38:31 (Jan.) 1916.

articles.[2] Early use with the lingual arch and the suggestion of using the lingual arch for anchorage reinforcement may have given the impression that the high labial arch is dependent on the lingual one; whereas, it may be used as a complete appliance by itself.

The term high labial arch is not accurately descriptive as it may be used for lower teeth, in which case it is low instead of high. It was at first called the concealed labial arch, one of its advantages being that most of it is concealed by the lip (Fig. 2). Another merit of this arch placed beyond the teeth is that it does not interfere with lip movement as much as one crossing

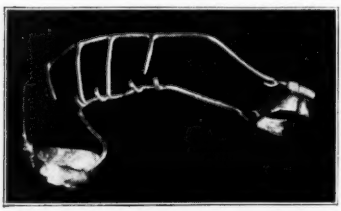

Fig. 1.—Early high labial arch in combination with lingual one.

the teeth; but the chief value of the appliance lies in its possibilities of individual tooth movement through adjustment of spring extensions instead of by realinement of the base wire. In this respect, its mechanical principles are radically different from those of the small gage arches directly engaging brackets or tubes on banded teeth and transmitting force by manipulation of the base wire itself. The individual spring extensions of the high labial arch allow a tooth to be moved in any direction without undesirable reactions on adjoining teeth as with these other appliances. This difference and superiority were explained in a paper before the American Society of Orthodontists in 1917.[3] With the addition of recurved springs engaging tubes on banded teeth as shown at that time (Fig. 3) and making possible such a variety of movements of one tooth by its

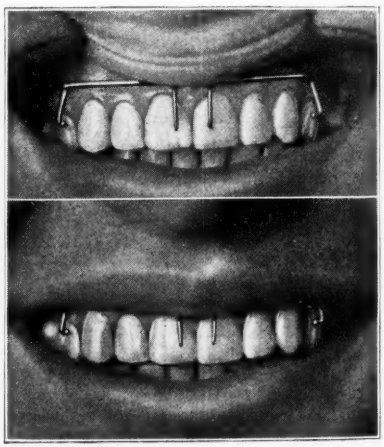

Fig. 2.—High arch in mouth; showing inconspicuous position.

individual spring, I believe the high labial arch to be the best general purpose appliance. No part of it is patented, no fancy prices need be paid for manufactured parts and no special instruments are required for its manipulation. The expression "general purpose appliance" is used advisedly, because there is not

2. Dewey, Martin: Lingual Arch in Combination with the Labial Arch with Extensions as Used by Dr. Lloyd S. Lourie, Internat. J. Orthodontia, 2:593 (Oct.) 1916; Use of the Lingual Arch in the Treatment of Malocclusion as Used by Dr. Lloyd S. Lourie, ibid., 2:648 (Nov.) 1916; Labial Arch with Spring Extensions as Used by Dr. Lloyd S. Lourie, ibid., 3:526 (Sept.) 1917.

3. Lourie, L. S.: Concealed Labial Arch with Spring Extensions, Internat. J. Orthodontia, 4:24 (Jan.) 1918; Dent. Items Int., 40:296 (April) 1918.

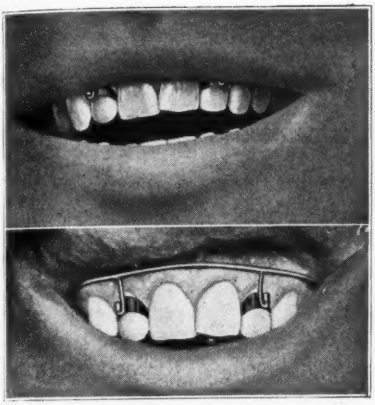

Fig. 3.—Spring extensions recurved into vertical tubes on incisor bands. Various movements are obtained by manipulation of this end of spring.

and never will be any one appliance that is best for all purposes, and for an inventor or manufacturer to make such claims is an insult to the intelligence of the thinking orthodontist. Various types of lingual appliances, for instance, for certain purposes, excel labial ones; but they too have their limitations. It is wise, therefore, not to be limited to one mechanism but to chose the one best suited to the case.

The appliance here discussed will be considered under three headings: (1) the base wire and its anchorage; (2) the spring extensions and their attachments, and (3) its application or use in various kinds of malocclusion. The base wire (Fig. 4) should be fitted to lie beyond the margin of the gums, the distance averaging about one-eighth inch, but being determined and sometimes limited by the attachments of lips and cheeks, particularly the frenum labium. To avoid interference with the lips and cheeks, the base wire should lie close to the gum but not in contact with it. If there is to be root movement, extra space should be left. Here, the larger base wire has an advantage in that it is less liable to cut into the lip or cheek from muscular contractions or external force. Mechanically considered, the size of the base wire depends on the material used and its length. When anchored to molars, 17 gage (0.045) gold-platinum wire has been the most satisfactory, while if bicuspids or cuspids are used for anchorage, the arch being shorter, a smaller base wire may be used, 19 gage (0.036) iridioplatinum having answered the requirements. As previously stated, the essential requirement of the base wire is that it "be sufficiently rigid to prevent its displacement by the reaction of the spring extensions when they are delivering force to the teeth." The attachments of the base wire

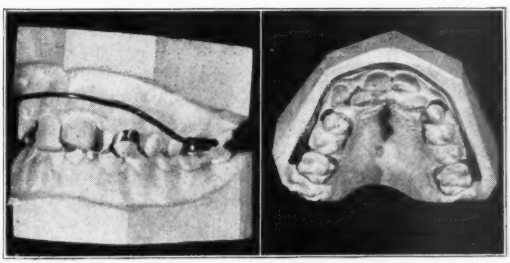

Fig. 4.—Position and shape of high arch.

to the anchor bands may be of various kinds, this depending on the anchorage requirements and the choice of the operator. I prefer horizontal round tubes receiving threaded ends of the base wire with nuts for adjustment. They allow the incisor section of the base wire to be kept the proper distance from the gums, while incisor roots are being moved labially or lingually, and give anchor teeth greater freedom of reaction to the forces of occlusion than do the more rigid attachments. Then, too, the horizontal tubes allow mesial or distal movements of anchor teeth when indicated, the anterior teeth being grouped for anchorage. If it is necessary to fasten the arch in buccal tubes, it may be done temporarily with silk ligatures, or more permanently with wire locks. These are made by forming an open eyelet in a short piece of a 22 gage wire (0.025), closing this eyelet around the arch in front of the nut and then bending the free end into a hook behind the buccal tube. The principal anchor teeth may be reinforced by a lingual arch or by extensions from the labial arch to the other teeth in various ways, as will be explained later. Most of the shaping of the base wire may be done on a plaster model, preferably with buccal anchor tubes in place, though this should be checked by a final adjustment in the mouth. I find it best to begin the fitting at the center, following with the sides and finishing with the alinement of the ends with the buccal tubes.

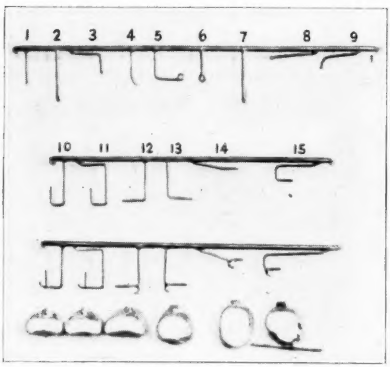

Fig. 5.—Various springs for high labial arch. Springs Nos. 1 to 9 are for use without bands; Nos. 10 to 15 for use with bands and tubes or hooks. The lower row of springs are the same as Nos. 10 to 15, but with the addition of hooks for greater control of rotation or root movement.

Spring extensions will be described under two headings: plain, numbers 1 to 9, and with tube attachments to banded teeth, numbers 10 to 15 (Fig. 5). All are made of high fusing spring gold wire, the size varying with the length, but 22 gage (0.025) wire for the long springs and 24 gage (0.020) for the short ones has been found satisfactory. They should have sufficient spring to allow the ends to be flexed 0.5 to 1 mm. without making a set bend. The plain springs are principally useful for incisors, 1, 2, and 3 being for lingual movement, the bent tip on 2 being to prevent extrusion. 4 is for mesial or distal movement, 5 for rotation with ligature and 6 and 7 for labial movement, 6 with ligatures, 7 with hook over occlusal edge. If the vertical portion of 6 must be short, its elastic range may be increased by adding a horizontal section, which gives added length. The springs used without tubes may be given greater elastic range and lighter pressure by tapering, which, by diminishing the bulk of the free end, compensates for possible loss of elasticity in the attached end from soldering. Spring number 8 is for lingual movement of cuspids or bicuspids or erupting incisors and 9 is for distal movement of the cuspids or bicuspids. Numbers 10 and 11 are for any movement of

incisors by proper manipulation of the short vertical end before insertion into the tube, the long vertical part acting as a fulcrum if rotation is necessary. Number 11 has a horizontal portion added for greater range of spring with lighter pressure. Number 12 may be used on incisors with hook for labial movement, extrusion or intrusion. Number 13, with the tube on cuspids or bicuspids, may be used for any movement; while numbers 14 and 15 are used for any movement of cuspids or bicuspids, except mesial or distal, by manipulation of the end of the spring before inserting into the tube. Beneath 10 to 15 are shown the same springs with spurs added after the larger wire is heated to redness. If the two are heated together, there is danger of overheating the smaller part before the base wire is hot enough. Ends to be inserted into tubes should be formed before soldering to the base wire.

In some of the cases to be shown for illustration, other appliances were used for the lower teeth, and these were purposely omitted from the pictures, as it seems advisable to limit this presentation to some of the various uses of the high labial arch rather than to attempt full consideration of case treatment requirements. Case 1 (Fig. 6) shows an appliance fitted to a plaster model and ready to be transferred to the teeth in the mouth. It will not all be used at first, the incisor band and spring extensions having been fitted here to show their possible use later in the treatment. The appliance should be placed on teeth as nearly passive as possible, and at the next visit of the patient, the first pressure is applied to the cuspid and first bicuspid by springs number 15. Later, after some lateral expansion of the dental arch, attachments may be made to the lateral incisors by either of the methods shown, eyelet and ligature, as with spring 6, or band and tube, as with spring 10. The spring extension to the right bicuspid has the root controlling hook, which may or may not be added to the cuspid spring later. These horizontal extensions to cuspid

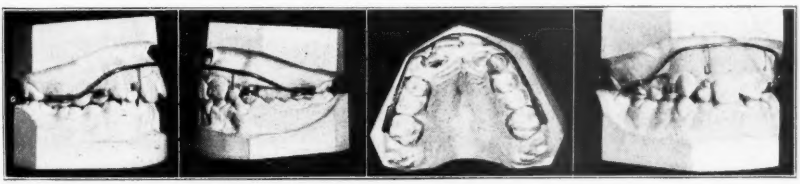

Fig. 6.—Springs Nos. 6 and 10 for lateral incisors; No. 15 for cuspid and bicuspid and anchorage reinforcement.

for double control of rotation or root movement. This grouping of springs with their numbers is not intended as a general or fixed classification, but simply as a convenience in referring to them in this paper. Some of these, as well as others, have been described by J. W. Ford,[4] together with the application of McCoy open tubes. In attaching springs to the base wire, 18 carat solder is used, being first fused to the spring, which is brought in contact with the base wire

4. Ford, J. W.: Some Results with Lourie High Labial Arch, Internat. J. Orthodontia, 12 (April) 1926; High Labial Arch Technic and Some Results, ibid., 14-699 (Aug.) 1928; Progressive Changes in High Labial Arch During Treatment, ibid., 14:303 (April) 1928.

and bicuspid must have enough spring to allow the use of the vertical tubes on the lateral incisors.

One of the most satisfactory uses of this appliance is for retracting protruding upper incisors. It is seldom necessary to use bands on the incisors in this movement, and if they should be thought advisable in order to expedite or give better control over rotation or root movement, they may usually be dispensed with after short use as temporary retainers. Secondary retention may then be obtained without incisor bands by combining the lingual arch with the labial one. In these cases too, it is often necessary to restore lip function, and the high arch causes less interference with this than the ones placed across the teeth.

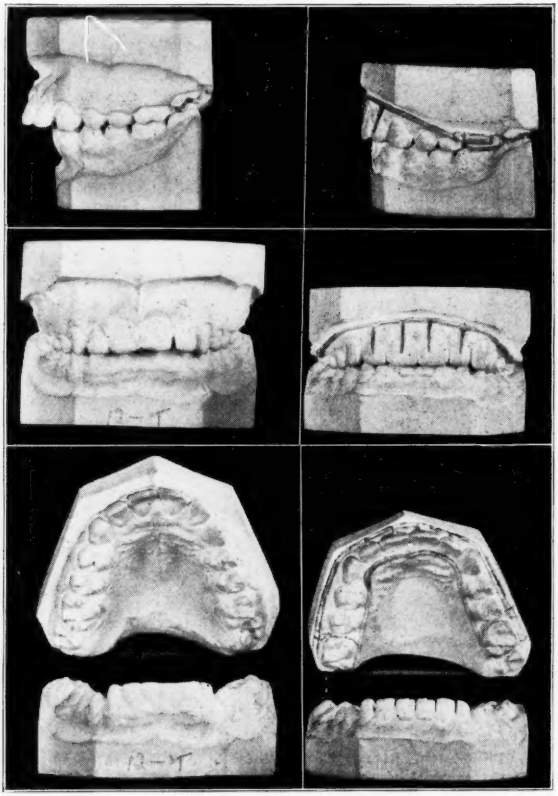

Fig. 7.—Spring No. 1 for incisors, and lingual arch for anchorage reinforcement.

In Case 2 (Fig. 7) (neutroclusion), it was used without any bands anterior to the molar anchorage. These teeth were reinforced by a lingual arch resting against the incisors just below the

gingival ridge and serving the additional purpose of a fulcrum or form against which the teeth were forced by the labial springs (No. 1). No manipulation or reshaping of the lingual arch was done in this treatment.

In Case 3 (Fig. 8) (distoclusion), no bands were used on the incisors, but as the dental arch required widening, the attachments (Springs 13) used on deciduous molars, for that purpose, served also as a reinforcement for the molar anchorage. Lingual horizontal exten-

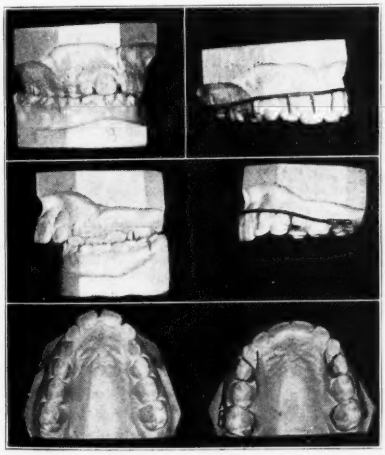

Fig. 8.—Springs No. 15 on cuspid for arch expansion and anchorage reinforcement. Springs No. 1 for lingual movement of incisors and springs No. 4 for mesial movement. Lingual arch for retention and anchorage reinforcement after removal of cuspid bands and No. 15 springs.

sions to cuspids and second bicuspids allowed one labial spring on each side to move three teeth bucally. Number 1 springs were first used on the central incisors only, but later on the lateral incisors also. Distoclusion of the dental arches is being corrected by muscle exercises

In Case 4 (Fig. 9) (distoclusion), the attachments (Springs 15) used to move the deciduous cuspids also reinforced the molar anchorage. Straight springs were first used to start moving the central incisors lingually. Additional

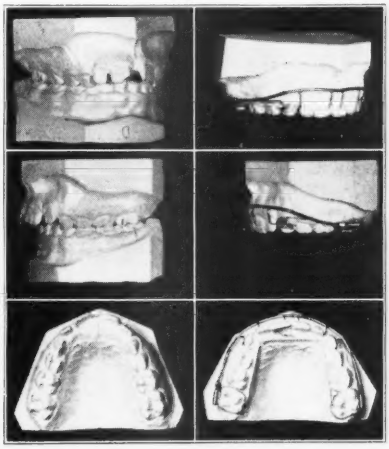

Fig. 9.—No. 13 springs to bicuspids for arch expansion and anchorage reinforcement; No. 1 springs for lingual movement of incisors.

Fig. 10.—No. 12 springs engaging hooks for labial movement and intrusion of central incisors; No. 3 springs for lingual movement of lateral incisors.

springs like the one on the left lateral incisor (Spring 4) were then used against the distal sides of the central incisors to move them mesially, closing the space

between them. Later, springs as shown on the left lateral incisor (modified 4) were used on both of these teeth to move them lingually and mesially. As the upper left central incisor was not completely rotated by the labial pressure, a lingual arch was used with a spring extension against its distal lingual surface. The application of the lingual arch allowed the removal of the cuspid bands and labial attachments. The distoclusion in this case is also being corrected by muscle exercises.

In Case 5 (Fig. 10) springs No. 13 were used in hooks on bands on the central incisors for intrusion and labial movement, while No. 3 springs were used to move the lateral incisors lingually.

In Case 6 (Fig. 11) (distoclusion), the high labial arch principle was used for both upper and lower appliances though different from the preceding ones in their molar anchorage ends. A lingual arch was substituted for the lower one as soon as the cuspids had been sufficiently

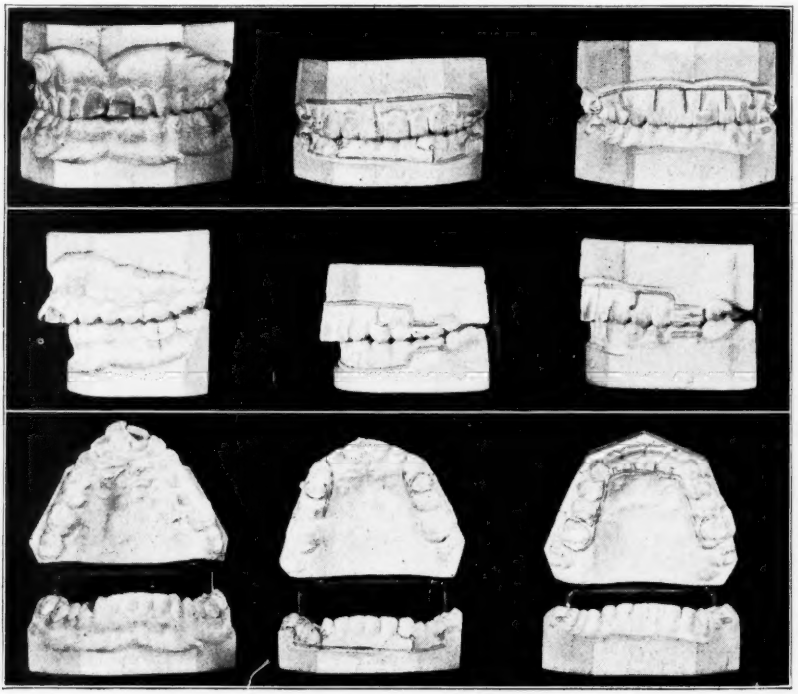

Fig. 11.—No. 13 springs on bicuspids for upper arch expansion and anchorage reinforcement; No. 2 spring for lingual movement of maxillary incisor without extrusion; No. 6 for labial movement of mandibular cuspid; No. 1 springs for rotation and root movement of maxillary incisors after addition of lingual arch with flattened extensions as fulcrum for each incisor.

moved by No. 6 springs, and another lingual arch with flat extensions to the incisor was combined with the upper high labial arch for incisor rotation and root movement as soon as the lateral expansion of the upper dental arch had been accomplished by the labial springs

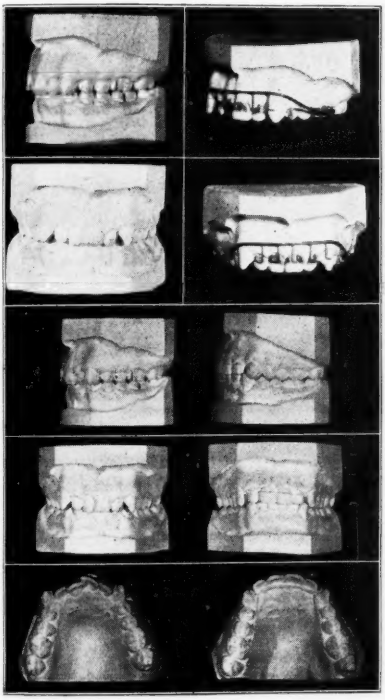

Fig. 12.—No. 10 springs on maxillary incisors allowing them to be used as anchorage to assist the distal movement of the molar by intermaxillary force, at the same time correcting incisors. No. 4 spring for distal movement of maxillary cuspid.

No. 13 to the first bicuspids. After the addition of the upper lingual arch the bicuspid bands were removed and these springs reversed, as shown in Figure 2 to form hooks for intermaxillary anchorage for correcting the distoclusion. During the first movement of the upper right central incisor, the molar anchorage was reinforced by the attachments to the bicuspids, but after the addition of the

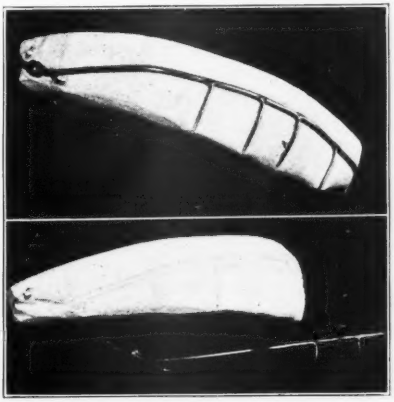

Fig. 13.—Plaster block with grooves for protection of removable high arch worn intermittently as retainer.

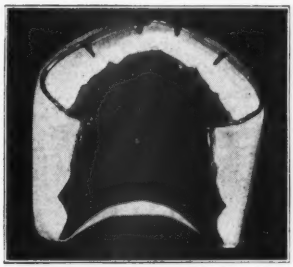

Fig. 14.—High labial arch section adapted to Hawley retaining plate.

lingual arch, it added sufficient anchorage by contact with the lingual surfaces of the incisors. The first labial spring to the upper right central incisor, No. 2, was bent across but not beyond the occlusal edge to prevent the tooth's moving occlusally from the spring pressure

on its sloping labial surface. After the addition of the upper lingual arch with a flattened extension as a fulcrum for each incisor, their root movement and rotation were completed with plain labial springs.

In Case 7 (Fig. 12) (unilateral distoclusion), the four incisors were used as anchorage, together with the right first molar, to supplement intermaxillary anchorage in the distal movement of the molars on the left side. The extension hook for intermaxillary rubber ligatures was attached by means of a short tube fitting loosely the labial arch in front of the molar buccal tube and making traction distally on the molar only. A coiled spring distal to the arch nut supplemented the intermaxillary force and was effective continuously, even when the rubber ligatures were left off accidentally or during meals. Next, the upper left cuspid was moved distally by a spring extension, No. 4, and the incisors were rotated and moved to the left by the recurved springs, No. 10, in tubes. The incisors were not all started moving at once, but one at a time, beginning with the left lateral incisor. After the incisors were moved, the right cuspid was moved mesially with a spring extension, No. 4, similar to that shown on the left one. The incisor bands were allowed to remain for about 5 months as temporary retention, after which the bands and labial arch were removed and a lingual arch substituted, the incisors being ligated to it with iridioplatinum ligatures.

In some cases, retention is provided by continuing the moving appliance, but in a passive state; while in others a combination of lingual and labial arches often allows a reduction in the number of bands and simplification of the labial appliance. With this combination, the labial arch may, after a reasonable length of time, be left out temporarily to test natural retention, or it may be worn only at nights. In either case, a plaster block should be provided for the labial arch when it is not being worn. (Fig. 13.) If it should seem desirable to dispense with bands entirely, the Hawley plate may be used with a high labial section (Fig. 14).

THE LINGUAL ARCH MECHANISM*

By WILLIAM A. MURRAY, D.D.S., Evanston, Ill.

IT is only through the realization that with repetition we learn that I consented to write a paper on the lingual arch mechanism. I have nothing new to offer either in its use or technic of construction. Consequently, this paper is practically a review of the work of others.

Variations of the lingual appliance were used by early orthodontists, such as Angle and Case, as retaining appliances. Pliers for stretching this wire were placed on the market by Angle.

As to the history of the lingual appliance, Lloyd S. Lourie was probably the first orthodontist to use such a mechanism in active treatment. He employed a soldered lingual alinement wire, which was adjusted by means of the Lourie

*Read before the Section on Orthodontia at the Midwinter Clinic of the Chicago Dental Society, Jan. 14, 1929.

wire-stretching pliers, which were a modification of the old Angle pliers. Force was supplied to individual teeth in some cases by lateral extension wires to individual teeth. This wire might also be lengthened by the special pliers.

The appliance was not used successfully by many men owing to the fact that it was impossible to obtain special pliers made so as to operate accurately, and also because few men could master the technic of stretching the wire without occasional serious displacement of the anchor teeth. John V. Mershon of Philadelphia was one of the first to make extensive use of a removable lingual appliance (removable by the operator, not by the patient). This first appliance was a single wire locked to anchor bands, usually on the first permanent molars. This wire was accurately adapted to the lingual surfaces of all the teeth, and, by slight readaptation at proper intervals, force was exerted which finally resulted in a normal arrangement of the teeth. As a further development, auxiliary springs of smaller gage wire were soldered to the base wire and furnished the principal force for tooth movement.

Biologists tell us that growth is a fundamental property that all organisms have. This is a property that is a part of inheritance, and if this is true, growth cannot be supplied by an orthodontic device. While we must admit that the growth tendency of the jaws and supporting structures cannot be supplied from the outside, this growth is influenced by environment. When an appliance is placed on the teeth, it becomes a part of the environment of the mouth and therefore of the teeth.

In selecting an appliance, an important requisite is that it produce a minimum of interference with the functions of the teeth or associated parts. We must remember that there is an interrelationship of function between the teeth, the peridental membrane, the bony structure, the muscles of the oral cavity, the nervous system and the circulation. The appliance, to produce the proper stimulation of the tissues supporting the teeth to be moved, must act in such a way that this interrelationship of function will not be seriously disturbed. Each individual tooth has a certain amount of normal movement in its socket which reacts on the supporting structures. If this normal movement is interfered with by the use of appliances rigidly attached to teeth which are to be moved, the normal functional relationship between the teeth and the rest of the tissues is disturbed and probably a long period of wearing retaining appliances will be necessary, because of this interference with normal functional relationship.

There are several reasons for placing an orthodontic appliance on the lingual surfaces of the teeth. Since the normal development of the dental arches is a general enlargement forward, outward and occlusally, we can place an appliance on the lingual surfaces of teeth and not interfere with development, since the normal direction of growth would be away from the appliance. The labial and buccal surfaces of the teeth are left free for the cleansing influence of the lips and cheeks. The lingual appliance has advantages in interfering in the smallest degree with prophylactic measures, as there is an absence of ligatures, and the appliance rests on normally clean areas of the teeth. The modern tendency is for orthodontic patients to desire an appliance which is inconspicuous, and the lingual appliance answers this need. Other requirements of an orthodontic appliance are stability of attachment and strength with delicacy, and it should be adjustable

so that continuous, gentle pressure may be applied and maintained in a definite manner. These requirements are fulfilled in a large degree by the lingual appliance. The means of attachment to the anchor bands is a form of stationary anchorage. Sufficient strength is provided by the use of small wires and a continuous gentle pressure may be controlled so that frequent appointments are unnecessary. The teeth, except those used for anchorage, are not held rigidly but have practically their normal freedom of movement under the stress of mastication, a movement which is generally recognized as being essential for the normal development of the investing tissues. This freedom from rigid attachments also permits a change in the occlusal plane of the dental arches which is necessary in the treatment of some forms of malocclusion, particularly in case of mixed dentition. Ligatures are not used in connection with the lingual appliance, and thus a potential cause of caries is eliminated, as well as improper pressure, which may result from broken or loose ligatures.

The principal function of the lingual appliance is to enlarge the dental arches. This may be brought about by changing the shape of the base wire itself or by the adjustment of the auxiliary springs. It is often necessary to make adjustments of both the base wire and the auxiliary springs.

Individual teeth may easily be moved buccally, labially, lingually, mesially or distally, and also be elevated or retruded by proper manipulation of the appliance. In fact, groups of teeth or the entire arch may be moved in almost any direction. In some cases, rotation of teeth may also be accomplished, although a labial arch wire is usually better for this purpose and may be applied after the lingual appliance has produced the other necessary tooth movement.

The lingual appliance may be used on either the maxillary or the mandibular dental arch. When used on the maxillary arch, care must be exercised to see that the mandibular teeth do not occlude against the base wire. It may be used also in connection with a labial arch appliance. I have found it very desirable when used in conjunction with Dr. Lourie's concealed labial appliance. The lingual appliance is not and never has been advocated as a universal appliance or a panacea for all of the problems that confront us in the practice of orthodontia. It is not ideal and has its disadvantages, as have all other appliances; but in the hands of many operators, it has proved very useful and efficient. After all, it is not the particular appliance that counts so much as the effects produced on the vital tissues.

While it is important to have the knowledge and ability to use the appliance, it necessarily follows that one must first be able to master its technic of construction. Materials of many different alloys and sizes were used and numerous locking devices were experimented with before the mechanism was developed to its present state of efficiency.

HOW CAN THE GENERAL PRACTITIONER BE ASSISTED IN THE SOLUTION OF HIS FULL DENTURE PROBLEMS?*

By L. G. JORDAN, D.D.S., New York City

HOW can the general practitioner be assisted in the solution of his full denture problems? The subject is a broad one. It may infer the consideration of methods, technic, instrumentation or fundamentals, or of all these.

An attempt to do justice to all in a paper which is limited by time and is a part of a symposium is quite out of order. It would therefore seem best to give a general review of denture prosthesis, laying particular stress on the fundamental factors which, in the past, do not seem to have been given the deserved attention by the general practitioner.

Too many of our confrères are indifferent to the rapid progress which is being made in the art of restoring lost natural dentures with artificial substitutes. There is nothing mysterious or mythical about scientific denture construction, and it remains only for the operator to acquaint himself with the fundamental principles and procedures involved and proceed to their practical application in denture construction.

REVIEW

The general practitioner is usually the exodontist as well as the prosthetist, and he is therefore in position to obtain valuable records of the facial profile, tooth arrangement and other special characteristics before extracting the natural teeth. Such records will aid materially as guides in constructing the artificial substitutes.

Many patients are already edentulous, and without the above mentioned records, the dentist must rely on his judgment in establishing a contemplated relation of facial profile and contour to tooth arrangement.

A few casts of pleasing natural anterior teeth would offer valuable suggestions in these cases.

EXAMINATION

Before attempting denture construction, the operator should thoroughly acquaint himself with all the conditions presented by the patient which may have a bearing on the desired results.

A thorough roentgenographic examination may reveal root fragments, areas of rarefaction, impacted teeth, sharp spinous ridges and many other conditions which might assist in defeating the operator's best efforts as well as create an undesirable impression in the mind of the patient and his associates.

The most outstanding proof of the value of the roentgenographic examination which I have met was the finding of seven impacted teeth in the mouth of a patient, aged 38, who was apparently edentulous except for fifteen badly broken down teeth, which were to be removed.

*Read before the Section on Full Dentures at the Midwinter Clinic of the Chicago Dental Society, Jan. 14, 1929.

Jackson[1] of Detroit has contributed much toward better denture service through his studies of the osseous supporting structures as revealed by the roentgenographic examination.

The general health of the patient should be taken into consideration. Cooperation with the patient's physician will often result in a correction of conditions which might otherwise be attributed to faulty denture technic.

Study models will aid especially where pronounced tuberosities would interfere with the wearing of dentures. Undesirable tuberosities may be reduced on the cast and the cast used as a guide when reducing the undercuts in the mouth. The preexamination of denture patients is very important.

IMPRESSIONS

After sharp spinous ridges, loose flabby areas and undesirable undercuts have been suitably corrected by operation, the next procedure is that of securing the impressions.

In view of the extensive consideration that has been given to impression technic for a number of years, it would hardly seem necessary to call attention to the fundamental principles involved in this procedure. A few visits to commercial laboratories will soon convince the inquisitive that a review of the subject might decidedly enhance the denture service which many patients are receiving.

It is discouraging to note that large orthodontia trays heaped with plaster still are used in the routine impression technic for full dentures by a large number of our confrères. These impressions give no consideration to overextensions, relief of hard areas or border adaptation of the finished denture bases.

An excellent plaster impression technic known to me is used at New York University Dental College.

The full compound technic is serviceable in the hands of the exacting operator, but requires a greater degree of skill than any of the other methods.

For the maxillary impression, the combination plaster and compound technic seems to offer possibilities that are not to be found in either the plaster or the compound technic when used separately. Every operator should acquaint himself with the manipulation of both materials in order to meet fully the requirements of each individual case.

Regardless of the method used, impressions should accurately record the denture seating areas and develop well rounded tissue trimmed borders which extend to the limits of comfortable toleration of finished denture bases in the mouth. Hard areas should be amply relieved in the impression while the patient is present.

The so-called postdamming of the maxillary denture base seems to be best accomplished upon the cast, although, in the hands of the expert, it may be satisfactorily established in the impression. Casts should reproduce in detail the well rounded borders and other characteristics obtained in the impression.

BASEPLATES

Hanau[2] and others have stressed the importance of using baseplates which present identically the same tissue seating surfaces as the finished denture bases.

Baseplate wax is absolutely useless for this purpose, although often used by indifferent operators. The temporary baseplate materials now available do not

1. Jackson, H. H.: Radiography from the Point of View of the Prosthodontist, J. A. D. A., 13:601 (May) 1926.

2. Hanau, R. L.: Articulator Technic for Full Denture Prosthesis.

meet fully the requirements for full denture construction, owing to warpage occurring both in the mouth and during tooth arrangement.

The permanent metal bases, such as gold, palladium and stainless steel, are ideal and should be used whenever possible. The chromium or stainless steel base just mentioned, which is being used at New York University, is proving very satisfactory. The low cost of this base alleviates the economic problem which so often prevents the use of the other metals. Vulcanite baseplates are very acceptable when, for economic reasons, the metal bases are out of the question.

Regardless of the type used, the baseplate should be carefully tested and should meet the requirements of finished denture bases in the mouth.

OCCLUSAL RIMS

Occlusal rims may be made of compound or very hard wax, the main requisite being that they retain their accepted form during the making and checking of relationship records in the mouth.

THE ARTICULATOR

From the standpoint of application, the articulator question seems to have been fairly well settled in that an adjustable articulator is considered essential to efficient denture construction. Plain line or arbitrary articulators are no more acceptable for full denture construction than a universal prescription would be for grinding the glasses which many of us wear. I have been using the Hanau model H articulator and technic and have found it very acceptable for full and partial denture construction.

The face-bow should be used in mounting the maxillary cast to the articulator.

Establishing centric relation (erroneously called taking the bite) is one of the most important steps in denture construction and should be executed with extreme care and precision. The mandible is said to be in centric relation to the maxilla when in the most retruded rest position from which lateral movement can be made.

It is absolutely essential that the mandibular baseplate be mounted to the articulator in centric relation to the maxillary baseplate if further procedures are to be successful. Centric relation must of necessity be recorded in the mouth and then transferred to the articulator.

Various methods are used to secure this relation record, but owing to the influence of tissue resiliency and displacement, it seems that records made without pressure are most desirable for the purpose of adjusting the articulator; zero pressure being the only definite degree of force which we may repeatedly record with accuracy.

With the mandibular base mounted in the articulator in its correct relation to the maxillary base, a protruded record should be made in the mouth and used in the articulator for adjusting the condylar guides. This should also be an unstrained record.

With both baseplates mounted in the articulator in accordance with the above mentioned records, the accuracy of the centric relation mounting should be checked with the aid of the needle point tracer. The Sears needle point is an excellent instrument for this purpose. The Stansbury recording plates, when properly mounted in the occlusal rims, will assist materially in securing accurate tracings.

To carry out the entire procedure requires far less time than it would take to describe it and the operator is assured of

accuracy before proceeding with future steps.

ANTERIOR TOOTH ARRANGEMENT

The anterior teeth are selected to meet the individual requirements of the patient as to size, color and form. The maxillary anterior teeth should be arranged to conform to the general facial contour, esthetics and phonetics and other individual characteristics that may have been suggested by the preextraction records or otherwise.

The arrangement of the mandibular anterior teeth should follow, and it is here that special stress should be laid on stability and mechanical requirements. The necks or gingival portion of these teeth should be set over the crest of the ridge, and for mechanical reasons, the incisal edges should not be inclined labially beyond a line vertical to the labial border of the denture regardless of the degree of horizontal overbite (overjet) existing between the ridges.

The common practice of setting the mandibular anterior teeth labially from the crest of the ridge for the sole purpose of accomplishing an end-to-end bite is positively wrong, and it accounts for many of the facial deformities which are so prevalent among denture patients. This type of construction often destroys phonetics as well as the possible stability of the mandibular denture base.

Another point to be stressed in anterior tooth arrangement is that of avoiding deep vertical overbites. Neither esthetics or phonetics require the deep vertical overbite so often found in artificial dentures.

POSTERIOR TOOTH FORM AND ARRANGEMENT

With the anterior teeth arranged to meet the requirements, the next step is that of selecting and arranging the posterior teeth. It might be well to digress for a moment and call attention to the more recent trend in posterior tooth form.

You are referred to articles by Gysi, Sears,[3] Boyce,[4] Russel, Schwartz, Schroeder and Jordan[5] in which tooth form is given due consideration. High cusps aping exaggerated natural tooth forms are detrimental to denture stability. They contribute to trauma of the supporting structures and may be undesirable for other reasons. Good impressions, baseplates, mouth records and balanced occlusion all have their influence on the ultimate result, and the same may be said of tooth form, although, until recently, little attention seems to have been given to this important factor.

The conditions under which the natural and artificial dentures must function are different. Artificial dentures can well be likened to machines, and, for that reason, will prove most efficient when constructed to comply with the laws of mechanics for machines working under similar conditions.

As the teeth are the contacting surfaces of the denture apparatus in the mouth, their occlusal form will have a bearing on the efficiency with which the dentures glide upon each other in function. Other reasons for using special tooth forms in artificial dentures have been considered in the papers previously mentioned.

3. Sears, V. H.: Jaw Relations and a Means of Recording the Most Important Articulator Adjustment, Dent. Cosmos, 68: 1047 (Nov.) 1926; Balanced Occlusions, J. A. D. A., 12:1448 (Dec.) 1925; Some Fundamental Factors in Tooth Articulation, J. Dent. Res., 8 (June) 1928.

4. Boyce, A. E.: Occlusions, Jaw Relations and Ridge Relations, J. A. D. A., 15:2267 (Dec.) 1928.

5. Jordan, L. G.: Means of Minimizing Shifting of Full Denture Bases, J. A. D. A., 15:2220 (Dec.) 1928.

The outstanding tooth form of the nonanatomic type is the so-called channel posterior, which has been brought to its present state of development by Sears[6] of New York.

I first became familiar with channel posterior teeth through using them in private practice. This familiarity soon developed into enthusiasm, which later became a conviction and has been materially strengthened through observation and experience at New York University Dental College, where several thousand channel posterior dentures have been constructed with very satisfactory results.

There are many advantages to be found in the use of channel type posterior teeth. In the hands of one who has a true conception of the fundamentals of balanced articulation, they offer a degree of refinement in denture function and efficiency that is very desirable.

ARRANGING THE POSTERIOR TEETH

The detail of arranging channel posterior teeth has been given elsewhere. One point should be called to the attention.

When channel posterior teeth are to be used, the anterior teeth should, in many cases, be arranged with practically no vertical overbite if the full mechanical advantages of this tooth form are to be expected. The fact that there is no interlocking of cusps anteroposteriorly is considered a decided advantage by those operators who are acquainted with the practical application of this tooth form.

Regardless of the type used, posterior teeth should be arranged to provide the maximum of balancing contact in all relations and should be returned to the mouth for careful checking before we proceed with the future steps.

Some operators proceed personally with the pouring of casts in the baseplates, flasking, vulcanizing and finishing, have this work done under their personal supervision, or relegate the work to some outside laboratory. Personal attention to the work seems to be preferred.

A few points relating to this work might be mentioned. Casts of artificial stone, Spence plaster or like materials require less care in handling and are less liable to fracture than are plaster casts under similar conditions.

The old bolt type flask and those with loose fitting joints offer such uncertain results that their use is unwarranted. There are some very good flasks available which provide ample room for allocating the cast and have locking devices which prevent disturbance of the relationship of the teeth to the cast.

Ample provision should be made for the overflow of excess rubber to prevent distortion of the denture during vulcanization. Heavy pressure in closing the flash should be avoided, for it is here that many otherwise satisfactory dentures are ruined.

Spring pressure provides an excellent means of holding the two halves of the flask together during vulcanization. Most dental rubbers come out better when vulcanized at lower temperatures over a longer period of time, as will be found on experiment.

The trimming and polishing should be done with care to avoid loss of the well rounded borders previously produced on the baseplates. Dentures with razor edge borders have no place in the mouth.

After vulcanizing and polishing, the dentures are placed upon the articulator mounting casts in the articulator and the condylar guidances are set to the original

6. Sears, V. H.: Channel Type Posterior Tooth Forms, J. A. D. A., 15:1111 (June) 1928.

records. These records are checked, and corrected if necessary.

With the aid of very thin carbon paper, any existing high spots are located and removed with small mounted stones. The operator should locate and eliminate errors in one relation at a time, beginning with centric relation and following with any necessary correction in the lateral relations.

The teeth are then milled with fine abrasive paste to perfect the occlusion, and the dentures placed in the mouth and checked for accuracy of relationship.

Subsequent checking of the various relationships will provide the maximum of denture comfort and efficiency.

CONCLUSION

After careful observation and inquiry, I have found that those in our profession who are considered leaders and authorities on full denture problems are not necessarily dentists who limit their practice to full denture construction but, in general, are individuals who assume the responsibility of acquainting themselves with the best literature and ideas on the subject and apply precision and exactness to every detail involved in denture construction. This is my answer to the question: How can the general practitioner be assisted in the solution of his full denture problems?

209 East Twenty-Third Street.

OSTEOMYELITIS OF THE JAWS*

ALBERT D. DAVIS, D.D.S., B.Sc., M.D., San Francisco, Cal.†

OSTEOMYELITIS, as defined by McCallum, is "a destructive process affecting the periosteum, the cortex and the marrow." Disagreement by various authors as to the correct term to be applied to that type of infection resulting in bony dissolution or destruction of the maxilla or mandible has led to a thorough investigation of the word and its true meaning. Particular emphasis has been placed on the word "myelin," which is used as the body of the word osteo-myel-itis, with the suffix and the prefix well understood (if such nomenclature is applicable). As myelin is not a true synonym for bone marrow, but refers, according to Whiting, and also to Stimson, to any soft part on which the integrity of the bone wholly depends, or to all the soft parts which contribute to the nourishment of the bones, this disagreement is without foundation. Whiting even goes so far as to state that every bone in the body contains marrow or endosteum, but that there are many bones which contain but few myelin cells in the immature, and in adults none. Myelin is a substance which, contrary to the accepted teachings, plays no part in the nourishment of the bones, but acts purely as a blood producing element or organ.

Infectious osteomyelitis, occurring as it does in the soft tissue of any bone, causes a destructive inflammation with suppuration. Were the myelin cells confined in the marrow, osteomyelitis could be found only in the long bones which

*Read before the Oakland Dental Club, May 31, 1928.

†From the department of Plastic Surgery, Leland Stanford Medical School.

house the marrow. However, these cells are found in as large numbers in flat bones as in the bones which contain marrow. The flat bones have the same general characteristics as the long bones, the soft tissue content replacing the marrow, and containing, as above stated, myelin cells.

It is therefore considered perfectly correct to apply the term "osteomyelitis," instead of "osteitis," "periostitis" or other names to the acute suppurative inflammation of the soft tissues of the maxilla and mandible.

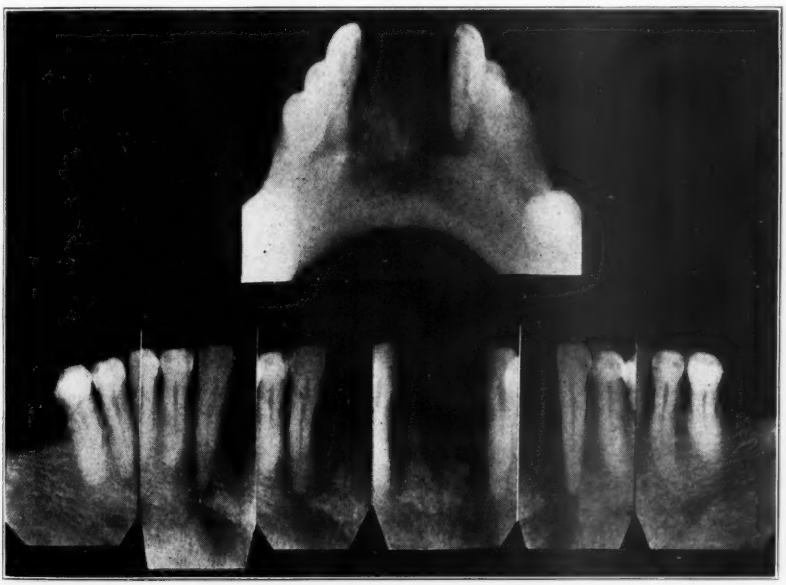

Fig. 1.—Acute osteomyelitis of the mandible, involving the area from cuspid to first bicuspid of the opposite side. The sequestrum has been definitely walled off from the healthy bone with lines of demarcation clearly visible. The bone involved has a worm-eaten appearance and there is characteristic thinning-out of the necrosed area. In this case, there was a high degree of toxicity with general weakness, pyrexia, enlargement of the lymph glands and marked discharge of pus. Exfoliation was complete on the sixtieth day of the disease.

OCCURRENCE

In an analysis of cases, Vilray P. Blair,[1] of St. Louis, found thirty-three cases affecting the lower jaw, eight affecting the upper jaw, and one which involved both jaws. The proportions in relation to age were two-thirds in adults to one-third in children. The same relative proportions occurred in respect to males and females, the males predominating.

ETIOLOGY

The etiology of osteomyelitis of the jaws in the majority of cases may be traced to a lighting up of some latent in-

1. Blair, V. P., and Brown, J. B.: Personal Observations on Osteomyelitis of Jaws, Internat. J. Orthodontia, 12:52-68 (Jan.) 1926.

fection, principally by an extension of the infection around a carious tooth, the presence of a gangrenous pulp, postextraction neglect or any infection in a wound which reaches the bone or periosteum. Other causes include those of hematogenous origin, trauma, chemical poisoning, syphilis and extremes of temperature.

Osteomyelitis of hematogenous origin usually occurs a few weeks after some acute infectious disease, such as scarlet fever, influenza, measles, typhoid fever, diphtheria and chickenpox. This type of osteomyelitis naturally is found, in the majority of cases at least, in children. Whether or not the specific infection is directly responsible or the general lowered resistance of the individual, due to the infection, plays the major rôle in the etiology of osteomyelitis following acute infectious disease is at present a debated question. It is a well known fact that typhoid bone infection (usually involving the long bones) is a definite entity and that pure cultures of typhoid bacilli have been isolated from the sinuses, even in old bone sinus cases. In these cases, the location is in the diaphysis of the bone and the periosteal involvement is much greater than the bone reaction. Careful histories, laboratory tests and the roentgenogram will aid the surgeon in a differentiation.

Smallpox complicated by an osteomyelitis usually attacks the epiphyseal line of the long bones and is rapid in onset, causing widespread symmetrical dissemination and little or no suppuration. Mention is made of these two types of osteomyelitis because of their more common occurrence. It must be borne in mind that a child may develop an osteomyelitis around an apparently healthy tooth or even one which is vital and noncarious. In these cases, the etiologic factor is of hematogenous origin. On the other hand, the child may develop an os-

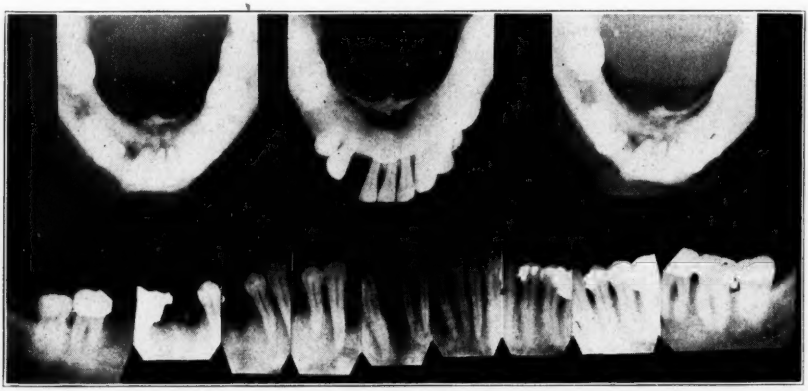

Fig. 2.—Acute osteomyelitis with involvement of the lingual plate of the mandible. Sequestration is incomplete. Duration of disease was six weeks. The infection was of the low grade type without marked symptoms. There was a small amount of discharge and very little toxicity present. The patient was ambulatory and seemingly had a high degree of resistance to the invading organisms. Clarity was obtained by various angulations of the "cracker-bite" exposures.

teomyelitis following the extraction of an infected tooth. If a history of an acute infectious disease of recent date is also obtained, the question arises as to the true etiologic factor—the preexisting periapical infection, the specific organisms of the disease, the lowered resistance caused by the disease, or the combination of all.

In any event, the symptomatology, progress and treatment remain the same when osteomyelitis develops in the jaws.

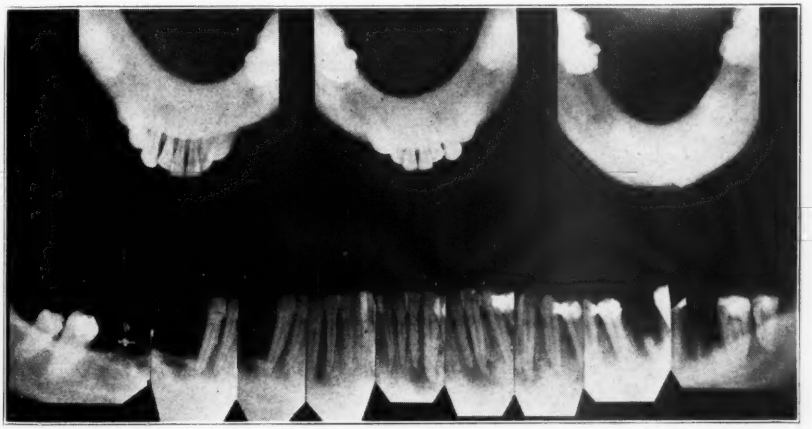

Fig. 3.—An old chronic case of osteomyelitis with involvement of most of the mandible. There was a history of acute osteomyelitis following extraction of a tooth eight years perviously. The patient was confined to the hospital for a period of eight months, during which time many sequestra were exfoliated. The condition after three months' treatment and surgical removal of all infectious foci is shown. There is "filling-in" of the cancellous bone around the teeth. All symptoms have ceased and the patient is rapidly gaining in weight. The roentgenographic evidence is important. Ramifications of the disease must be obtained by repeated experiments from every angle and type of exposure. Where extensive edema is present, extra-oral plates, preferably stereoscopic, are made and supplemented by a series of "cracker-bite" exposures made sublingually. As soon as the edema subsides, a series of intra-oral dental films are made to bring out in more detail the ramifications of the disease. Later exposures used as check-ups on the course of the disease should be made, at as nearly the same angle and with the same roentgenographic technic as was used before.

PATHOLOGY

It is difficult to understand the pathologic processes that are associated with an acute osteomyelitis without constantly bearing in mind the anatomic and histologic structure of the parts involved. It must be remembered that the soft parts of the bone, consisting of a stroma of connective tissue enclosing blood vessels, nerves, lymphatic bone cells and fat, are found, not only outside and within the bone, but in the haversian canals as well. As destructive inflammation involves the soft tissues of the bone, and is designated as acute infectious osteomyelitis, it is well to recall the location of the soft parts involved. Infection occurs in two ways: through the blood stream or directly by means of some break in the continuity of the soft parts. The organisms involved

are principally the staphylococcus, streptococcus, pneumonococcus and mixed bacteria. Any pathogenic organism capable of being transported in the blood stream may be deposited in the bone and produce suppuration. The invasion of the cancellous bone may occur before the symptoms become manifest. On the other hand, the periosteum alone may be involved at first, in which case symptoms of pain and swelling appear at the onset.

The organisms increase in number, phagocytosis occurs and sepsis results.

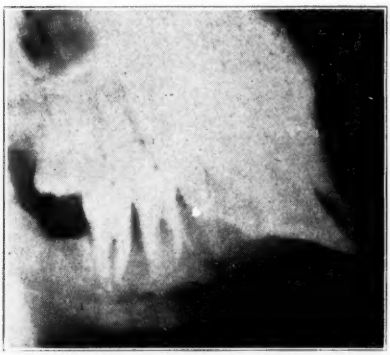

Fig. 4.—An extra-oral plate showing a large area of osteomyelitis involving the anterior part of the mandible. The theory of extension of the disease by way of the mandibular canal, as held by some authors, seems unsound, as in this case there is involvement around and including the mental foramen without extension at the angle.

Liquefaction or breaking down of the bone followed by complete or partial necrosis and sequestration occurs as an end-result. There are cases in which no sequestration occurs. The usual period of necrosis with exfoliation of sequestra and formation of the involucrum is about ninety days.

SYMPTOMS

Where primary bone invasion has occurred, pain is extreme at the onset even though the cause may be unrecognized. Edema occurs and pus localizes in the region involved. The infection spreads rather rapidly, this depending on the virulence of the organism and the resistance of the individual. A low grade infection may assume a high degree of virulence, if the resistance of the individual is well below par. Overwork, systemic disease, shock, chill, exposure, malnutrition, pregnancy or even a severe cold may lower the resistance of the host to such a degree that the bacterial invasion may be fatal.

Sinuses may form at points quite removed from the original site of the infection. The periosteum is stripped from the bone, which is exposed and has the characteristic "worm-eaten" appearance. If this condition is allowed to continue, the bone becomes exfoliated after necrosis is complete.

The patient becomes quite toxic in the early stages of the disease, and general weakness, fever and loss of appetite are marked. The breath is fetid and there is an enlargement of the lymph glands, which become quite sensitive to palpation. If the lingual plate of the mandible is involved, there is a characteristic thickness of speech due to swelling of the submental region, and a consequent lack of mobility of the tongue.

Trismus is usually present if the muscles of mastication are near the diseased area and are involved in any way. There is an increase in the white cell count. Severe local and referred pain, due to pressure on sensory filaments within the periosteum and bone, may cause great distress. It is well to remember that the roentgenogram may show no bony

changes during the first week or ten days of the disease.

COURSE

Osteomyelitis of the jaws usually runs a more or less prolonged course, lasting from four to eighteen months or longer. From the onset to the exfoliation of sequestra and formation of the involucrum, the usual time is about ninety days. By this time, the involucrum will be of sufficient strength so that removal of the sequestrum is permissible.

Subsequent areas may develop or several segments in the same jaw may be in various stages of the disease. Cases have been reported which have persisted for a number of years.

PROGNOSIS

Again, in the prognosis, we encounter virulence and resistance. There are also to be considered the amount of involvement, the location of the disease and the type of bacterial organisms present. Fortunately, few cases of osteomyelitis of the jaws are fatal, if properly treated. The patient should be warned during the initial stage of the disease that there may be serious complications and sequelae, if strict conformity to rules of hygiene and treatment are not followed. He should also be told something of the length of time usually necessary to obtain a cure. There will be certain periods when the symptoms tend to flare up anew, then decrease, only to flare up again. This knowledge will tend to carry him over the "rough spots" of his treatment, and if he is told in advance what he may expect, he will have greater confidence and respect for the surgeon.

COMPLICATIONS

1. Any one or all of the salivary glands may become involved in the spread of the infection, perhaps breaking down and suppurating.

2. Metastasis may occur, whereby the heart, kidneys or other vital organs may become involved in the general infection. Other bones may be affected by infected material being carried through the blood stream.

3. Pathologic fracture often occurs in cases in which there is a large amount of bone involvement or the disease in the mandible literally cuts through the bone from the teeth to the external plate. Even after apparent healing and freedom from discharge, I have had two cases in which fracture resulted when the patient yawned.

4. Fistulous tracts leading from the original focus to the skin, which may apparently heal, only to break down months later, are present in old chronic cases. Contraction of these old tracts results in a characteristic dimpling of the skin.

5. Ulcerative stomatitis in localized areas, usually in and about the third molar region, may occur, owing to the presence of virulent organisms in the mouth and the lowered vitality of the tissues surrounding an erupting third molar.

6. Peritonsillar and pharyngeal abscesses may result from the conditions given above.

7. Ludwig's angina, although rare, may occur in spite of extensive drainage, medication, etc., and, once established, carries with it a high mortality. In these cases, a very small amount of pus, if any, is found when incision is made, and, instead, a turbid, foul serous fluid, often containing gas bacilli, is present.

8. Thrombosis of the cavernous sinus is an occasional complication and a very serious one. Protrusion of the eyeball, extreme prostration, edema of the orbit

and eyelids with other symptoms relative to disturbance in vision, etc., should indicate the involvement of the cavernous sinus.

DIFFERENTIAL DIAGNOSIS

Diagnosis of osteomyelitis is comparatively simple as a rule. The history, the roentgen-ray findings and the nature of the discharge all tend toward an early diagnosis.

Sarcoma.—This condition, especially where both extra-oral and intra-oral swelling and softness of the tissues are present, may be confused with osteomyelitis. The teeth may be loose in their sockets and present other characteristics of osteomyelitis. The history, roentgenogram and discharge will eliminate the confusion in the diagnosis.

Actinomycosis. — Microscopic examination, secondary skin involvement with repeated breaking down into fistulous tracts should make differentiation from actinomycosis an easy matter. The chronicity, history, living conditions, including locality, and the finding of distinct yellowish masses of the ray fungus in the purulent matter, which when rubbed between the fingers gives a gritty and sandlike sensation, are distinctive features of actinomycosis. The bone enlarges and becomes painful. Edema, softening and infiltration of adjacent parts, with secondary purulent fistulous tracts to the skin, and late involvement of the lymph glands, should differentiate actinomycosis from osteomyelitis.

Tuberculosis.—This may occur as a distinct entity as tuberculous osteomyelitis, or as a secondary infection superimposed on an ordinary osteomyelitis. The roentgen-ray and laboratory findings and the microscopic examination are important. The point of predilection is the infra-orbital border of the maxilla. The chronicity and mildness of the infection, together with the concomitant signs of tuberculosis elsewhere, may obviate errors in diagnosis.

Syphilis.—Tertiary syphilis of the jaw bones, although quite rare, is to be considered. Generally attacking the maxilla, it may be confused with tuberculous osteomyelitis. Negative Wassermann reactions are the rule in about 15 per cent of cases of syphilitic bone lesions. Provocative Wassermann tests and spinal fluid examinations should be instituted in suspected cases. Specific treatment instituted as soon as diagnosis is confirmed leads to early improvement.

Treatment.—The treatment of osteomyelitis of the jaws depends on one factor, which must always be constant; that is, conservation. In order to be safe, go slowly. Time is a great healer, and the treatment which is safe and sure requires all the patience at your command. The old proverb, "Haste makes waste" was never so truly applicable as in a case of acute osteomyelitis of the jaws.

Spontaneous drainage is usually established in most cases of osteomyelitis of the jaws. Pus exudes from around the teeth and is more marked at the site of the greatest involvement. This may or may not be in the region of the original infection.

If there is drainage, it must be continued. If not, it must be established early with the least possible trauma. This is a disease in which the overzealous operator must substitute judgment for instrumentation, patience for zeal, treatment for operation, and caution for haste. The terrible deformities which result from ill-advised surgery in osteomyelitis of the jaws are a direct end-result of misunderstanding and lack of knowledge.

As soon as drainage is thoroughly established, hot irrigations of some bland solution, such as physiologic sodium chlorid, compound solution of cresol, 15 drops to 2 quarts of water, or any non-irritating drug, are instituted. I prefer some deodorant, such as the cresol solution, in order to clear up as quickly as possible the foul odors. These irrigations consist of 2 full quarts of solution, not a half a glass nor yet a few spurts from the spray bottle, but a generous and complete healing lavage twice a day, with instructions to the patient that the continuation of such treatments at home will aid in cleaning up the mouth and lowering the virulence of the infectious organism.

Complete *débridement* of spiculae of sequestrated bone and granulomatous tissue is instituted superficially. The area is irrigated until the virulence of the infection has subsided. Just how much time this will take depends again on the type of organism and the resistance of the individual to the infection.

During this period, a diet high in nourishing value is prescribed. Too much importance cannot be placed on the medical care of these cases. As lowered resistance plays such an important rôle in the development and progress of the disease, a diet planned to build up this resistance is indicated. Milk, eggs, fruit juices, stewed fruits, cereals, cooked vegetables, etc., are the mainstay in such a diet. Medically, cod-liver oil emulsions, bitter tonics, such as tincture of gentian compound, phosphomuriate of quinin, iron, quinin and strychnin or something equally efficacious is prescribed. Blood transfusion is often of great value.

Sun baths or ultraviolet ray treatments are aids not to be overlooked. When the patient is ambulatory, fresh air and sunshine are insisted on.

Where pain is severe, the following prescription has been found to give relief: amidopyrin and acetylsalicylic acid, 5 grains each, mixed and made into twelve powders, and one powder taken every two hours, for pain if needed.

When the patient gains weight in spite of the infection present and the constant discharge of pus, the prognosis is good. The subsidence of the acute symptoms, together with a gain in weight, is usually the turning point of the infection. Nevertheless, the irrigations are just as important at this time as ever. Localization of the infection, to prevent a general septicemia and metastasis, together with the building up of a patient's resistance to the invading organism, constitutes the greatest safeguard against complications which may arise if these factors are neglected.

Rest is essential especially in the initial stages of the disease. When a patient is suffering from an infection, such as is present in an osteomyelitis of the jaws, his tissues are utilizing more energy than is required for daily labor. If such extra exertion is added, the disease may be very slow in progress and may develop into a chronic osteomyelitis, with years, instead of months, elapsing before a cure is effected. Hospitalization is the ideal, but often is unnecessary. Ambulatory cases, especially after the first severe symptoms are safely past, seem to do well, if properly treated.

I cannot emphasize the dietary requirements for these cases too strongly. Most important are those foods high in vitamins C and A. Cod-liver oil and whole raw milk in abundance will supply vitamins A and D. Tomatoes and oranges, lemons, limes and all the other citrus fruits provide vitamins and tend

to reduce acidosis. Lima beans, either in soups, served as a vegetable or ground into flour and made into bread, are high in value as an antacid. Cod-liver oil contains vitamin D, which is necessary for building bone. Vitamin D is also developed in the skin by the action of ultraviolet rays, either in sunshine or the mercury-quartz lamp.

Calcium lactate in 5-grain doses has some apparent value in offsetting the calcium deficiency. Operative interference after thorough drainage is established and until the formation of sequestra is absolutely contraindicated. Superficial curettage after the exfoliation of the sequestrum is permissible, but such curettage should be delicately and carefully done.

Packing or dressings are to be condemned. As drainage is the object sought for, any type of dressing only tends to dam up the pus and prevent its exit.

Application of external heat or of ichthyol, antiphlogistin and other drugs in the same category are dangerous. Ice packs are indicated instead, even though the patient takes kindly to dry heat or poultices. Cold not only reduces the inflammation present, but also decreases the rapidity of growth of bacteria. The only exception to this rule is that, after all other means have failed and the inevitable "pointing" externally has occurred, continuously applied hot fomentations may aid in the localization of the pus externally to a point where extra-oral incision may be made to avoid important structures such as the parotid gland, seventh nerve, etc.

If in this paper nothing else is learned but to avoid placing hot fomentations to the face and jaws in virulent infections, it has accomplished a great purpose. The laity as a whole, and even a great many physicians and dentists are too often influenced by the appeals of the patient for greater comfort, and, as a result, heat is used where cold is indicated. All of us have been offenders, but one case of the avoidance of a disseminated infection by the substitution of ice for heat is worth all the grateful words of a pleased patient for the use of a warm poultice.

Vaccines, antitoxins and serums may aid, in selected cases, to destroy the micro-organisms. Autogenous vaccines are, as a rule, the most efficacious, although good results have been obtained in the use of stock vaccines and serums. The greatest value from their use is to be obtained early in the course of the disease. The removal of the sequestra is usually quite simple. The important factor is patience until the sequestra are ready to be exfoliated. An incision is necessary in some cases in order that the involucrum may not be injured.

The removal should be accomplished with the least possible injury to adjacent tissues, unless the sequestrum is buried in hard bone. In the latter case, one wall of the involucrum may be chiseled away in order to permit delivery.

Clinical experience is the only criterion offered as to the time to remove a sequestrum. Spontaneous exfoliation is the rule, but even though one end may still be attached, it is often better to remove it than to wait. Roentgenograms taken at intervals in the course of the disease may be of great aid in determining the proper time for sequestrectomy. When, as often happens, the tissues overlying the bone break down and the bone is exposed as a dry, hard, nonsensitive mass, a large round bur is useful in removing the external plate and exposing the cancellous, bleeding bone. Sometimes, the immediate response is astounding in that, whereas

before there existed a large area of exposed bone, to all intents and purposes the beginning of a definite large sequestrum, there is an immediate formation of new fibrous mucoperiosteum and the bone again becomes covered. The exposed surface should be cut away in all directions up to and slightly beneath the healthy mucoperiosteum, but should stop when bleeding bone is reached. In some cases, this can be accomplished without the use of anesthetics, and if care is used to avoid the sensitive membranes covering the bone, the extent of necessary cutting is easily recognized. In one of my cases, this operation cleared up the formation of a large sequestrum in a very short time, where watchful waiting might have resulted in the loss of a large segment of the mandible, with a ghastly deformity.

After the removal of the sequestra, the irrigation should be continued at less frequent intervals until the case is finally dismissed. In cases in which deformities may occur after removal of bone prior to sequestration, immediate steps should be taken to prevent deformity by the orthodontist.

Other forms of treatment in vogue are those in which application is made to the skin of medium tending toward absorption through the tissues and affecting the bone beneath.

One of these is the use of cultures made from the discharging pus. The organisms are cultured in broth until devitilization occurs from autointoxication. In other words, the bacteria are allowed to grow and multiply in the same medium until they are no longer able to live in their own toxins. The medium is filtered and the bacteria are placed in new mediums and allowed again to reach the same end-result. This is repeated until no further growth appears. Then the broth is used as wet dressings applied over the affected part. Great claims are made for the cures effected by this form of treatment, especially in old chronic cases.

In 1925, Max Thorek,[2] of Chicago, brought to the attention of surgeons a new method of treatment of chronic suppurations, especially of bones. His method was based on his observations in the meat preserving industry, in which brine containing nitrate of potassium is used as the oxidizing agent.

In his first cases, he tried using potassium nitrate alone, in an endeavor to create antibodies by means of which the natural processes within the host tend to eliminate the invading organism. Although quite successful end-results were obtained, great irritation and sloughing occurred after ten days, the action of the potassium nitrate seeming to be cumulative.

After repeated tests, many failures and a great deal of research, it was found that the potassium nitrate when combined with aluminum nitrate seemed to inhibit the pain without decreasing the oxidizing properties of the potassium salt. The combination failed when used in high aqueous solutions, owing to the falling apart of the two salts, maceration of the tissues being again caused by the action of the potassium nitrate. Renewed efforts in research resulted in the formation of a stabilized compound from concentrated nitric acid which did not cause hydrolysis of the aluminum nitrate. Definite proportions are necessary to obtain this result, and I can best quote Dr. Thorek.

The quantity of aluminum nitrate and potassium nitrate used should be in proportion

2. Thorek, Max: New Method of Treatment of Chronic Suppurations, Internat. Clin., 1:137-168 (March) 1925.

of the molecular weight of one molecule of of aluminum nitrate to three times the molecular weight of one molecule of potassium nitrate. For example, 375 grains of aluminum nitrate and 303 grains of potassium nitrate in sufficient hot concentrated nitric acid to dissolve the substance will produce a solution from which the double salt $Al(NO_3)_3 3KNO_3 10H_2O$ will crystallize out on cooling and after drying the product it contains approximately 31% aluminum nitrate, 44% potassium nitrate and 25% water of crystallization. About 500 c.c. of concentrated nitric acid, kept hot by means of the water bath, is a suitable quantity of acid in which to dissolve one kilo of aluminum nitrate and potassium nitrate mixed in the proportions indicated. The described salt crystallizes from the concentrated nitric acid solution in the form of colorless rhombic and monoclinic crystals, which are readily soluble in cold or warm water in substantially all proportions. They possess an astringent, slightly metallic taste. This product is further diluted with nine parts of potassium nitrate, and the resultant mixture is incorporated in the dressing used in the treatment.

Investigations to determine the germicidal index of the aluminum-potassium nitrate compound resulted in the finding that, when added to culture mediums, this compound assisted and intensified bacterial growth. Animal tests proved it to be nontoxic, intravenously, subcutaneously, intraperitoneally and orally.

"The technic of application consists in applying a plastic dressing directly over the affected area, made up of a vehicle in which the compound is incorporated." Ordinary rolled oats, sterilized for two hours in an autoclave to prevent souring, and heated in an ordinary oven for from twenty to thirty minutes, will do. Fifty cubic centimeters of boiling water to each ounce of rolled oats, stirred until a uniform mass is obtained, with 13 grains of the aluminum-potassium nitrate compound to each ounce of oats used, produces the best results. This dressing is applied about one-eighth inch thick directly to the skin. It extends well beyond the affected area, and is covered over with waterproofing material such as wax paper or guttapercha. "The dressing should remain in absolute contact with the skin continuously and should be changed as often as it becomes saturated with secretions, and in any case should be changed at least once in thirty-six hours. No gauze should be interposed between the dressing and the skin."

Dr. Thorek claims that a simple gauze pack substituted for the plastic vehicle does not produce any of the typical reactions or effects. The effects produced are: (1) erythema in forty-eight hours; (2) vesicles and pustules, a few days later, continuing as long as infection persists in the underlying tissues; (3) recession of the area of reaction when infection clears in underlying tissues.

His theory is that nascent oxygen is liberated from the nitrate ion in its passage through the skin into the deeper tissues.

Reaction beyond the area of disease will not occur, which shows that the compound evidently has a selective affinity for the point of infiltration.

"In the case of a small area of osteomyelitis in the middle third of the femur, a dressing applied over the entire femur's length will not produce a typical reaction on the skin throughout the length of the area covered by the dressing."

Rapid autolysis at the point of infection and increased propagation of bacteria, local leukocytosis and phagocytosis are the results claimed. The virulence of the organisms decreases rapidly. The systemic condition of the patient improves and pain soon subsides.

Thorek advises starting with small doses, gradually increasing until the nitrate tolerance of the individual is obtained. One hundred and sixteen cases

were reported, including bone tuberculosis, osteomyelitis, postoperative wound infections and some forms of gangrene.

The results reported are worthy of consideration, and as several jaw cases are reported in his series, this form of treatment should be tried out at some time to determine its value over our present methods.

RÉSUMÉ

1. Osteomylitis of the jaws is a serious disease, characterized by inflammation of the soft parts of the bone and adjacent tissues, liquefaction of the bone and formation of pus, and, if untreated or improperly treated, may result in deformity.

2. It runs a rather definite course, with periods of subsidence and recrudescence and generally a fair prognosis.

3. The etiology is generally traceable to a "lighting up" of an old infection in or around a carious tooth or other infection; hence, the importance of the dentist in prevention.

4. The micro-organisms most commonly found are staphylococcus, streptococcus, pneumococcus, *Bacillus pyocyaneus,* mixed bacteria, etc.

5. Treatment is divided into stages of: (a) removal of causative factor; (b) establishment of drainage; (c) building up the resistance of the patient; (d) hot irrigations; (e) application of cold externally; (f) removal of sequestrums; (g) prevention of deformities.

209 Post Street.

THE PRACTITIONER OF DENTISTRY AND DENTAL EDUCATION AND RESEARCH*

By FREDERICK C. WAITE, Ph.D., Cleveland, Ohio

IN the United States, dentistry, the child of medicine, in the exuberance of infancy left the maternal domicile and declared its independence.

Whatever may be its present or future relation to medicine, in its historical relation, it is a part of medicine, and since a child inherits not only the benefits but also, to a certain extent, the obligations of its parent, American dentistry cannot escape certain historical obligations inherent to its coincidence with medicine through many centuries.

The advancement of knowledge is one of the major functions historically assumed by medicine and inherited by dentistry. Hence, the dental practitioner has definite historical responsibility to the promotion of learning.

RESPONSIBILITIES OF THE INDIVIDUAL

Each adult individual in normal mental condition has a series of personal responsibilities. These responsibilities entail certain duties to family; to the local community of which he is a part; to the larger community, the state, of which he is a citizen; and to his country. These responsibilities arise either through voluntary contract, as in the family; through

*Abridged from a paper read before the annual meeting of the Ohio State Dental Association, Cleveland, Dec. 7, 1927. Received for publication Jan. 14, 1929.

legal obligation, as a part of his citizenship, or through duty inherited from the past.

PROFESSIONAL RESPONSIBILITIES OF DENTISTS

When an individual voluntarily associates himself with a group and expects to share the benefits that accrue to the members of that group, he, at the same time, must assume his proportional share of the responsibilities of that group. He should not expect to receive much and give nothing. Therefore, when an individual enters the dental profession, by that very act he obligates himself to render certain services looking to the general welfare of that profession. Of these, two of the most important are the promotion of education and of dental research.

EDUCATIONAL RESPONSIBILITIES OF THE DENTAL PRACTITIONER

Through the centuries, many individual physicians performed their duty in individually teaching students. The teaching of single students by the individual gradually was superseded by group teaching. Groups of associated teachers instructed groups of professional students, each teacher giving instruction in that part of the field of his profession which he was especially fitted to teach. Teaching by these groups finally gave way to institutional teaching, and schools and universities took over, at first only a part, but finally nearly all of the duty of instructing and training prospective members of the medical profession. In its autonomy from medicine, dentistry in America has gone through a similar educational evolution.

These institutions are only the agents through and by which is in part fulfilled that duty of teaching which is historically and ethically incumbent on the entire profession and on each of its members. Nevertheless, this delegation of teaching to institutional agents does not relieve the dentist of all his individual responsibility as a principal in dental education.

A part of this remaining individual responsibility of the dental practitioner is fulfilled through organized dentistry. "Associated action" in dentistry in the United States first took definite form nationally in 1840, although it had arisen locally a few years earlier (1836).

The initial meetings of the American Society of Dental Surgeons (1840-1843); of the American Dental Convention (1855-1876), and of the American Dental Association (1859-1928) were in considerable part devoted to questions of dental education and of professional ethics. These were the major incentives for the national organization of dentists in the United States.

While, through the agency of institutions and through dental associations, a considerable part of the responsibility of the individual practitioner toward dental education is being fulfilled, there remains a very definite individual and personal obligation on each dentist.

THE PERSONAL INTEREST OF THE PRACTITIONER IN DENTAL EDUCATION

The discussion of dental education often brings a response from the dental practitioner to the effect that he does not feel himself concerned in the question, or sometimes even that he has no interest in the tendencies or methods of dental education. This point of view is illogical. Not only is it the definite duty of the dental practitioner to familiarize himself with dental education and to support it, but it is also clearly to his personal benefit to do so.

The quality of service of dentistry to the public is increased in direct proportion to the confidence that the public gains. This is true both collectively and individually. The confidence of the public in the profession and in the individual practitioner becomes a major factor in the ability of dentistry and the dentist to serve the community and the race. This confidence is inspired by two influences; namely, past performance and future promise.

The public is not logical in its judgments. It is constantly judging a class by its knowledge of, or experience with, a single individual or with a few individuals of that class. Public opinion is likely to proceed rapidly from a few particular instances to a broad generalization. Therefore, a very few unworthy dental practitioners may prove of great injury to the public status of the entire profession and thereby become a detriment to each member of that profession. A single ill educated, poorly trained, unethical, and incompetent practitioner in a community may diminish the reputation of all the members of the dental profession of that vicinity. That such an outcome is unjust does not alter the fact. Therefore, it becomes of direct personal interest to each dental practitioner that recruits to the practicing profession shall be of good character, well educated in the basic fundamental knowledge pertaining to dentistry, well trained, and competent to practice efficiently. Since the major part of the education and training of new practitioners must, in the present age, be secured in the dental schools, it follows that every dental practitioner is personally concerned that all dental schools shall be most worthy.

A profession is an aggregation of personalities. The identity, growth and ideals of a profession must be maintained by the summation and resultant of the efforts, good or bad, of all of its members, and the quality of service which a profession can and will give depends upon the qualifications of its members. The personnel of a profession is constantly changing. Its members retire or die and are replaced by new recruits. Therefore, the quality of the dental profession of the immediate and distant future depends upon the qualifications imparted, chiefly by training, to the new recruits. If these new recruits are to carry on efficiently, if they are to advance the profession yet further, they must be of good character, well educated, and well trained. Inasmuch as the selection of the individuals who are to enter the profession as well as the quality of their education and training rests with the dental schools, every practitioner, professionally as well as selfishly, must be interested in the dental schools, both those of the present and those of the future.

THE SCIENCES OF MEDICINE AND DENTISTRY AND THEIR ORIGIN AND GROWTH

The science of dentistry and the art of dentistry are two fairly definite parts of modern dentistry closely interrelated. One is dependent largely on the other. The failure to analyze dentistry into its science and its art has led to confusion both in the public mind and in the minds of the members of the profession.

The sciences of medicine and dentistry include, first of all, that vast body of facts relating to medicine and dentistry. Each of these sciences is the complement of the other. The facts cannot be antagonistic, although theories and procedure based on theories may be.

In addition to the great body of facts in medical and dental science, there are theories and hypotheses which aim to

bridge the many gaps between the known facts. A few of these have rested upon such unstable foundations and were so slightly based on facts that they cannot be called better than speculations, but the number of these speculations is being diminished each year as new knowledge emerges. Every proven new fact increases the stability of both the science and the art of dentistry.

This mass of knowledge consisting of facts, theories and hypotheses which collectively we call medical and dental science has arisen from so many sources that it is futile to attempt even to group the springs of origin. The components of this mass of knowledge have been accumulated mainly through two methods.

METHODS OF THE ADVANCE OF MEDICAL AND DENTAL KNOWLEDGE

The older method is that of mere observation. In its elaboration, it is called the empiric method. It was the predominant method until less than a century ago. It has certain very serious limitations. The second method is the experimental method. Through various extensions, it has come to be designated as the scientific method.

THE EMPIRIC METHOD

When interpretation and deductive reasoning were added to the category of observation of the results of trial and error, there was developed a procedure which is called the empiric method, which is subject to the danger of illogical reasoning bordering on speculation. As a result, "empiricists" often came to be a term of derision.

In medicine, through many centuries, and in dentistry more recently, the empiric method added to the accumulated mass of professional knowledge. Since the conclusions of the empiric method are in large and ever-increasing part based upon observed facts, it gave results far superior to the dogmas arising from speculation. In dentistry, the empiric method is essentially the careful record of observations in the course of practice. In a word, its essence is what is called experience. It is not characterized by the intellectual process of scientific reasoning. It is governed by prejudice more than by logic. Moreover, the empiric method is limited by the fact that it must await chance opportunity to solve questions.

Another limitation of the empiric method is that the opportunities for repetition of observations are uncontrollable and may be rare. At best, they are far apart in time and therefore not readily comparable. Deductions from a single observation are by no means conclusive, and repeated observations, preferably closely sequential, are necessary to reduce the average observational error. Therefore, early results from the empiric method cannot be highly trustworthy and must be considered provisional until they are many times confirmed by the same and by other careful observers. Only long series of observations by intelligent and critical men permit dependable conclusions.

Notwithstanding these limitations, the empiric method is capable of adding much to dental science when used by men who are well trained, accurate in observation and reliable in judgment. The dental practitioner, by a careful record of clinical observations, and especially of series of observations, can add to the science of dentistry and thus in some degree directly discharge his professional obligation of adding to knowledge of use to the profession.

THE SCIENTIFIC METHOD

Because of its limitations, the empiric method did not fulfil the requirements

for exact and complete knowledge, and there arose what was called the experimental method, through which, by devising experiments, observation could be controlled, repeated and carefully recorded.

Since Pasteur, it has been enlarged and used extensively, and the great advance in medical science in the last half century is due to the stimulus arising from the use of the experimental method.

The enlarged experimental method is now called the scientific method. It consists of a definite orderly attack on the solution of problems. It is initiated by a provisional hypothesis. It is much more complex than the empiric method and therefore offers many more chances of error, but when rigidly controlled in the hands of well-trained and critical men of good judgment, the scientific method gives results of a higher degree of reliability than does the empiric method. A prime essential is intellectual honesty, a state of mind in which the observer is equally willing to accept positive or negative evidence. The scientific method aims at a search for truth rather than confirmation of an idea. The scientific method is a powerful weapon in the attack on the unknown, but in the hands of the inexperienced, or intellectually dishonest, its danger is comparable to placing a loaded automatic revolver in the hands of a child.

RELATION OF THE DENTIST TO RESEARCH

Inquiry by the scientific method is known as research, a word which through misuse and abuse is rapidly losing any exact meaning. The scientific method requires extensive equipment, much material and a personnel that can control their time. Because of these demands, research has become very largely restricted to institutions. In medicine, these restrictions have segregated most of the research in hospitals, in endowed laboratories and especially in the medical schools of the universities. Comparatively little has as yet been done within these institutions toward promoting an attack on dental problems by the scientific method.

The individual dental practitioner usually has not the equipment, the facilities or the time to carry on research in dentistry by the scientific method. An essential of research is uninterrupted mental leisure. Worth-while research takes much time and usually does not permit uncontrolled diversions. The very etymology of the word implies many repetitions of the search for an answer to the particular problem. These circumstances make it unlikely that the dental practitioner, who must respond to his duty to his patients, can devote himself to the advance of medical and dental science by the scientific method. Although the dental practitioner cannot usually engage in scientific research, his interest in it should be keen, for on it depends the advance and greater usefulness of his profession.

Since the unanswered questions in dentistry are chiefly those that must be answered by the scientific rather than by the empiric method, it follows that, by a series of circumstances that could not be foreseen, the advance of medical and dental science has come to be largely a direct function of institutions, and chiefly of the universities. Although research in dental science is a function of the universities, they are giving little attention to it, for the reason that research of any kind is very expensive in men, in equipment and in money, and dentistry and dentists have not yet stimulated philanthropy to endow dental schools or dental research in the universities.

FUNCTIONS OF THE UNIVERSITIES IN REGARD TO DENTISTRY

I have indicated why the responsibility for the advance of medical and dental science by the scientific method has been laid on the universities, and especially on their professional schools. This responsibility has two definite features. The first is immediate promotion of dental research, by the endeavor to solve the many dental questions that arise at the present time and, what is most important, to reach solutions that are reliable and dependable. This entails meticulous care in every step of research. It demands mature judgment in interpretation of observations and in deductions from these interpretations to reach conclusions that may be applied. It calls for men of capability to prosecute and direct research. To carry on research requires a rare combination of unselfishness, patience, accuracy, correct mental attitude, rationality in deduction, reliable judgment and general intellectual honesty. The capability for reliable research is not found in every individual who aspires to publish something.

The second feature regarding research and the institutional relation to it is the necessity to train individuals who shall be able in the future to carry on reliable research. The few who are engaged in dental research grow old, retire and die just as do dental practitioners. Provision must be made not only to replace these but also to add greatly to their numbers in the future.

I have also indicated that, by another series of circumstances, the responsibility of training men to practice dentistry, once the function of the individual dentist, has also become segregated in these same universities and their dental schools. The epoch of the independent and proprietary dental school is gone.

The relation of the university to the advance of dental science is twofold. Also, its relation to training men for the practice of dentistry is twofold. The university, through its dental school, must not only teach the present-day dental students the science and art of dentistry: it must also train men to the profession of teaching the students of the future, men who will be ready to replace the present teachers when they shall have finished their task.

Hence, there have been segregated in the university dental schools of the country four functions; namely, the training of men to practice dentistry; the training of men to teach dentistry in the future; the advance of dental science in the present, and the training of men for research in order that dental science shall continue to advance.

If the university is to fulfil these four functions of teaching, training teachers, research and training men for research, it must have something beyond desires and good wishes.

Each of these functions requires both men and money. The dental school must have an educational personnel for both teaching and research.

The university must first of all find capable men who are willing to devote their lives to these services. They may or may not be members of the dental profession, but they will become members of the educational profession. They should be encouraged and honored by the practicing dental profession, for they are defenders of that profession. On the contrary, the practicing profession is accustomed to scorn the teacher or research man because, forsooth, he has a smaller bank account.

The member of the educational profession is entitled to remuneration comparable to that of the dental practitioner.

However, the student, whom the teacher serves directly, is unable to pay the cost of his education. Dental research serves the entire public. The students of an institution cannot be expected to pay its cost. Therefore, neither dental education nor dental research can be self-supporting. They must be subsidized by the public, either by support through taxation in the case of state institutions, or by private philanthropy for endowments and for current maintenance.

THE ART OF DENTISTRY

The art of dentistry is necessarily based upon the science of medicine and dentistry, but it involves the application of many other subsidiary fields of knowledge, such as psychology, sociology and economics.

The art of dentistry is primarily the application of the science of medicine and dentistry to individual and very specific problems. The art will not advance faster than does the science, although, since the art involves other fields of human knowledge and experience, its progress is not entirely limited by its basic sciences. The art is much more individualistic than is the science; hence, it is more widely variable.

While ultimately public welfare depends on the science, the contact of the public is directly with the art of dentistry. Therefore, dentistry, which is not analyzed by the public mind into its two constituent parts of science and art, is judged by the public more largely upon its opinion of and experience with the art of dentistry as practiced day by day.

The art of dentistry has been developed almost entirely by the empiric method; that is, by individual experience. The scientific method has been little applied to its development. When the teaching of medicine and dentistry was individual, consisting in the personal relation of preceptor to student, there was much instruction, both by precept and by example, in the art. Indeed, it may be said that the preceptor system emphasized the art almost to the exclusion of the science of these professions, then little developed.

The medical schools which first developed in this country were but supplementary to the preceptor system and were not presumed to replace it. The school afforded no clinical practice. The student attended the school for about four months, receiving some instruction in the science of medicine but more in the didactic discussion of the art. He then returned to his preceptor, under whom he continued to learn principally the art of medicine by contact with the private patients of the preceptor.

This was the condition in medical education when the first dental school was organized in the middle of the nineteenth century. Dentistry followed the current method in medicine, and so no clinical practice was given in the course of the first dental school in its early years. American dental schools required no service under a preceptor in the first thirty years of their existence.

It was soon apparent that the demand on entering professional practice was not far different for the physician and the dentist, and that it was necessary for the dentist to be skilled in his art before he began to practice. Since dentistry had developed no preceptorial system for instruction in the art, the dental schools were compelled to put teaching of the art, that is, clinical practice, into the school curriculum.

About fifty years ago, American medical science enjoyed a renaissance, under European influence, which stimulated not only research in medical science but also a major change in the medical curricu-

lum by introduction of increasingly extensive courses in the medical sciences. This resulted in a better understanding of medical science by every medical graduate and also in a great increase in medical knowledge through research by the scientific method. This research, however, did not extend to the oral cavity and especially did not include the teeth, the primary reason for this being that the dentists tacitly served notice on the medical profession that treatment of diseases of the teeth was the especial privilege of the dentist and that medicine should ignore the teeth. Medicine did so, not only in practice but also in research; and hence the backward state of our knowledge of medical science pertaining to the teeth is not the fault of medicine but lies directly at the door of dentistry, since dentistry inaugurated the policy and continued to support it.

The extension of attention to medical science in the medical curriculum became so great that it nearly obscured the teaching of the art, which became almost incidental, until not more than one-fourth of the present day medical curriculum can be said to be devoted to the art of medicine. In recent procedure, this deficiency is repaired by a hospital internship taken after graduation from the medical school.

The development of dental education during these fifty years has been very different; indeed, almost the reverse. The dental schools, having been compelled to introduce into their curriculum the teaching of the art of dentistry, were stimulated by its success and extended it. The renaissance in medical science in America did not reach the dentists or dental education. As a result, there was scarcely any research made by dentists by the scientific method on those problems of medical science pertaining to the teeth and their adnexa, a field shunned by medicine. In the dental curriculum, the teaching of medical sciences did not increase, lacking stimulus, and, as time went on, the dental graduate knew comparatively little of medical science.

The preponderance of the teaching of the art of dentistry in the dental schools increased until, by 1910, from 80 to 90 per cent of the effort of dental education was directed to the art, that is, to technical procedures and clinical practice. In 1910, dental education was still in the condition that characterized the medical education of the middle nineteenth century, predominantly the teaching of the art, with scant attention given the science.

With the extension of the dental course to four years, in 1917, the percentage of effort concentrated on the art was somewhat reduced, but today in the dental course, at least three fourths of the effort is on the art of dentistry, training in technical and clinical procedure and digital dexterity.

This preponderance of the art of dentistry has brought to the American dental profession high repute with the public, which bases its judgment almost entirely on manifestations of the art, but it may fairly be said that dentistry, lacking any broad scientific basis, has become top heavy with art and is a pyramid standing on its apex and swaying back and forth with the development of each new fad. Being unable of itself to determine whether a new fad rests upon a firm foundation of basic and medical science, it soon abandons one fad to pay homage to a newer one.

POWER OF THE DENTAL PRACTITIONER IN DENTAL EDUCATION AND RESEARCH

If, as I hope, I have shown that the dental practitioner is concerned in dental education and in dental research

from so many standpoints, it may well be asked how, if at all, he can have any influence in promoting the efficiency of dental education and of reliable dental research.

There are no individuals that have so great an influence on these matters as do the dental practitioners. It is through them that the public comes in contact with dentistry, and until the practicing dentists compel public interest in these activities, the public will be lethargic in their relations.

Do we expect religion to be promoted by the unreligious? Do we look to the city dweller to promote farming or to the farmer to promote manufacturing? No more can the promotion of the two activities of education and research, which so closely involve dentistry, be laid on the nondental members of our communities. The dentist may aid these two activities on which his profession depends, either through collective or through individual activity.

One of the two principal incentives to the national organization of dentists was the betterment of dental education. The national dental association, in the present day, considers educational problems through appointed committees. These committees are the servants of the association membership, and that membership can control the policies if it so desires; therefore every dentist has representation in national policies of dental education.

In stimulating the promotion of scientific knowledge pertaining to dentistry, this association should lead. Happily, it has a research commission, and to it each member annually contributes a small amount. This is a farsighted policy, but the contributions could well be extended.

The dentists are taxpayers, and in all parts of the country, except in the eastern states, a large part of the care of dental education and research must lie with tax-supported universities. Organized dentistry can do much if it makes effectively known its desire that in such institutions the departments related to dentistry shall be as adequately equipped, manned and supported as any other university department.

Let us come nearer home. Almost every dentist now practicing is a graduate of some dental school. In the majority of cases, this school is still active or has been merged into a school now active, which has thereby inherited its alumni. Each dentist through an active alumni association can be of very definite help to his school.

There is a crisis in dental education in the immediate present. There is an effort to reduce the required dental professional course to three years. This program can only mean abandonment of the fundamental medical sciences in great part, and a return to the curriculum, from 80 to 90 per cent mechanical, that existed before 1917. In this crisis, the alumni of each school can have a large influence in maintaining continuance of dental advance rather than permitting its retrogression.

The school graduate fails to realize his obligations to his school after he has graduated. He is likely to take a selfish attitude and to hold aloof from the school. He should recognize that his own school offers the most immediate agency by which he can discharge his professional obligation to further dental education and research. The gifts or legacies to universities from their dental graduates are very few as compared to those from the graduates of their undergraduate colleges. Yet the graduate of the professional school owes his success more directly to his school than does

the graduate of the arts college. At some time in his career, he should, at least in part, repay his debt directly.

It is not alone in direct associated action that the dental practitioner has influence in dental education. In indirect personal endeavor resides a tremendous power. The confidence of the public in the combined dental profession, and in the individual dental practitioner, gives the individual dentist opportunity to influence the opinion of the individual layman, and to instruct the individual units of the public in the facts and relations and needs of dental education and dental research. Thus cumulatively may he influence public opinion.

At present throughout the country, dental education is becoming restricted to universities. There is a spirit of extensive reform in the policies regarding that field of education. These policies include extension of equipment, gradual acquisition of a full-time teaching personnel and promotion of research.

These activities require a large expenditure in addition to the small contributions made by students in the form of tuition and fees. In part, these are capital expenditures, but mainly they are the cost of maintenance. Therefore, the universities, for their dental program, must have new resources in the form of additional public support, either through taxation or through philanthropy in the form of endowments. Temporarily, they need gifts for current expense until an endowment can be accumulated. Should not every alumnus of a dental school accept this opportunity to contribute to the maintenance of his own school in its program of promotion of the profession and of human welfare? Yet few or none accept it.

In another way, the practitioner can give moral support to dental education by adopting a better attitude in regard to teaching in dental schools. Too many practitioners are disposed to measure success in professional service by the sole criterion of monetary return. Their attitude toward the teacher is one of scoffing and derision because he does not devote his energies to practice and aim at a large income. They should know that there are other gods than Mammon.

The dental practitioner should remember that the teacher is his agent in carrying the professional duty of teaching which he himself refuses or neglects, and the teacher should be encouraged rather than belittled since, but for him, dentistry will not only fail to advance but will relatively retrograde.

Further, the practitioner should initiate and promote a policy of encouraging the most competent young dentists, as far as opportunity opens to them, to pursue an academic career in teaching and research. Dentistry can advance only if many of its ablest men devote themselves to teaching and research. The practitioner's present attitude of derision toward teaching makes it very difficult for the schools to secure and maintain an effective personnel.

In another regard the practitioners are guilty of moral dereliction toward their profession. One of the major deterrents to present-day dental education is the fact that many dental practitioners who attended school when the basic sciences of biology and physics were given no attention in the dental curriculum, and when but scant effort was made in teaching chemistry and the fundamental medical sciences, are prone to advise prospective and present-day dental students that these subjects are of little or no use, urging them to place their interest and effort only on mechanical

procedures and training in digital dexterity.

This influence increases the difficulty of giving dental students a solid scientific basis. The dentistry of the next generation must be based on the application of these fundamentals. This attitude of practitioners tends to thwart the endeavors of the school to train its students for the advanced status which dentistry must take if it is to be a learned profession and survive and merit the respect of other learned professions.

CONCLUSION

Dental education and research touch with a heavy hand every individual personally and intimately, be that individual high or low in the social scale, be he the edentulous octogenarian who has already exceeded the allotted span of life, or the infant just born into the world, or the prospective member of the generation as yet unborn.

Dental education and research especially concern and involve every dental practitioner. None such should say he is not concerned in dental education. He is concerned, historically, filially, selfishly, altruistically. He is not only concerned but should also be interested and active, for he has the greatest power, collectively, of all groups in determining the quality and the policy of dental education of the present, of the immediate future and of the distant future. In proportion to the judicial use of this power will the dental profession of today and of the future benefit. What is yet more important, in like proportion will the prosperity, health and happiness of the race be advanced. The future of the dental profession and of dental education lies in the hands of the dental practitioners. Will they arise to their opportunities and actively support a program of advance?

DISCUSSION

H. M. Semans, Columbus, Ohio: We have just listened to a presentation of dentistry as it impresses one who as a teacher sees beyond mere definitions and dates. A present definition of dentistry necessarily deals with the actualities and activities of the mass as seen at the present. Dates may fix such things as ancient dentistry, medieval dentistry, modern dentistry. A statement that dentistry is a profession must carry proof. What does the date 1840 signify? A strong desire to manifest itself as an identity by establishment of education, association and publication. Is this identity, crystallizing historically at 1840, a trade or a profession? Does the group become a profession simply by so declaring itself, or is such a group a profession because the public at large, the thinking, analyzing public so declares it? Dr. Waite has cut deep into actualities. He has surveyed the actuating causes, presented the followup of dentistry with medicine, differentiated between manual art and science. As he progressed, one may wonder, as a dentist, where one as a dentist may be. His conclusions, however, are hopeful, and he implies that it is up to the dental group to prove itself a profession. The idea of a profession is that of an occupation that involves a liberal education, with a strong bearing on the mental labor side as contrasted to the mechanical. The ministry, law, medicine, teaching, are all readily classed then as professions. We may readily recognize dentistry as a part of surgery that removes, or remedies or replaces by art diseased parts. Stomatology, on the other hand, is a part of medicine that understands scientifically the pathology of the mouth. Should we remain ancillary or subservient to medicine? If we practice only by artful measures the removal, remedying, replacement of diseased parts, can we claim ourselves on an equal standing? Repeating, then: Stomatology is a part of medicine that understands scientifically the pathology of the mouth. Let us define stomatology as we dentists would or should like it: Stomatology is an understanding of the pathology of the mouth including dentistry. May I quote here part of a letter from a father concerning his son, who is a student in dentistry: "I studied chemistry in high school, I taught chemistry in a country high school, I studied chemistry in ——— College, yet I knew but little of chemistry, and know

nothing of it now. Nor do I use it in my practice. Yet, Doctor, I must perforce leave it to the judgment of others as to its necessity for my son's education in dentistry." Let's have a picture of what occasionally happens: Two dentists are conversing, one a graduate of recent years, the other of many years back. The younger may relate the intense application he placed and was required to place on gross anatomy. That reminds the older man of his experience in the anatomy room, those long years ago, placing an ear or other part clipped from a cadaver in the pocket of a visitor, or about that time the boys one night slipped into the anatomy laboratory and had flash light photos taken in more or less grewsome postures. Another quotation from a dentist father to a dental dean: "Are you not losing sight of the necessity of skilful training in the practice of dentistry by so much outside stuff? When I went to dental college, we got our anatomy of evenings during a six-weeks course, and we got our other outside subjects at odd times; we were trained up those days as dentists." A part of the dean's reply was as follows: "In checking back, I note that you studied dentistry in a three-years course, when one year of high school or equivalent was all that was required for entrance. Each of the three years at your dental school ended in April. The total hours you put in in those three years amounted to 2,880; 2,400 of these hours were devoted to pure dentistry, 480 hours to a smattering of the fundamental sciences. Today, your son will spend in his four years a total of 5,200 as against your 2,880 hours. In the so-called pure dental courses, he will spend 3,640 hours as compared to your 2,400, and, in the sciences, 1,560 as compared to your 480 hours." Then the question of two years of arts-science as a requirement may still be a question of the why and wherefore in the minds of quite a number. A quotation from Dean Seashore of the Graduate School of Iowa in an article on "Education for Democracy" fits into our situation. "These two years should be a massive survey of the fields covered, particularly with the aim of showing relationship of fields of knowledge and fundamental principles, giving the student the information which is necessary, for an independent point of view and later exercise of initiative." Years ago, G. V. Black stated that a skilful mechanic could be trained and obtained in a reasonably short time of months rather than years, but where initiative, leadership and thinking scientifically was concerned, years rather than months must be involved; that the mechanic still remained the mechanic, whereas the collegiate had initiative, scholarship, leadership in his grasp. Two years of training in "knowledge and fundamental principles" with the full quota of professional training should meet the requirements for a professional status. Practically all our colleges are already on or planning such a basis: it is inevitable that all will come to it. As Dr. Waite says, a crisis is present in the dental educational field. The profession at large should bear a large responsibility in meeting this crisis. An encouraging interest, I believe, is already manifest to a large extent throughout the dental profession.

IMPORTANCE OF CERTAIN FEATURES OF DIAGNOSIS IN ORAL CONDITIONS*

By W. M. STOREY, D.D.S., A.B., LL.B., M.S., Madison, Wis.

AT the present time, the entire field of dentistry presents a peculiar situation. It resembles, one might say, a house divided against itself. It is stoutly maintained by many that dentistry is a branch of medicine. Others as vigorously assert that dentistry is not a branch of medicine but a separate profession. It is not the purpose of this discussion to decide the matter, but rather to emphasize the need and demand for a closer observation of pathosis in the mouth in both the medical and the dental profession.

In many countries, there is a special branch of medicine, stomatology, which deals not so much with the mechanical side of the management of diseases of the mouth (dentistry) as with the medical aspect: a study of the organs, tissues, and diseases of the mouth and their relation to the entire organism of man.

At one time, the American Medical Association maintained among its various divisions a section on stomatology, a department for medical men who were particularly interested in the study of conditions of the mouth. When this Section on Stomatology, the medical aspect of dentistry, was dropped by the organized medical profession in the United States, it was officially turned over to the dental profession. In the United States, there is no such branch in our medical schools, and therefore there is scarcely any instruction in diseases of the mouth, teeth or jaws as such. Because of the absence of thorough training and grounding in the basic sciences, medicine and surgery, and the lack of special study and training, the graduate in dentistry is not competent to manage cases other than those of a strictly dental nature. This special training is not obtainable in any medical or dental school but must be secured by study, apprenticeship and experience. This field may well be called no man's land, a field in which the dentist is but poorly trained and the physician not at all.

It is this borderline phase that I wish to discuss particularly. The best possible preparation for the study of pathology, microscopic or macroscopic, is, first of all, the study of the normal tissue. How can one recognize a diseased cell without a knowledge of histology? How can one recognize disease in the mouth without being familiar with the appearance of a normal mouth? As dentists practicing our profession, we have constantly before us a laboratory for study: every patient presents new material for study. With a definite knowledge of the normal, any spot, any deviation whatever, should immediately attract attention. How about the physician? He may observe the lips, casually glance at the tongue and take a peek at the tonsils; but why

*Read at a meeting of the South Dakota State Dental Society, Aberdeen, S. D., May 15, 1928.

should he stop and examine every nook and cranny of the mouth? That is the business of the dentist. If he does not do it, it probably will not be done. If the dentist fails to make the examination, the physician himself is justified in doing it, or referring the case when it is necessary for the welfare of the patient.

To attempt to produce expert diagnosticians, pathologists or surgeons in an hour would be foolish, and any such pretense would be quackish. The errors in dentistry are largely errors of omission rather than of commission; in other words, it is not because we do not know so much as it is because we do not look. We should educate our patients, train them to expect more from us, to demand more from us, and then fulfil the requirements.

We boast of the progress that has been made in dentistry, but do we realize what progress has been made in medicine? and how much of the progress in dentistry is really due to the progress in medicine? By strides made in the medical profession, the span of human life has been materially increased, but, on investigation, it is found that the greatest work in this respect has been done in cutting down the mortality in children. In adults, it has actually been increasing. In other words, it is preventive medicine that has produced good results. The term preventive dentistry has been criticized; perhaps, the modern term, contraceptive dentistry, is more acceptable. Contraceptive dentistry is that which prevents dentistry. What right has dentistry to exist, anyway? Is it not largely a makeshift? Why should there be devitalized teeth? Why should there be Vincent's infection? Percy R. Howe of Boston, by manipulation of their diet, has been virtually able to produce or suppress at will pyorrhea as well as the development of cavities in the teeth of monkeys.

Embryology teaches that a child actually inherits his teeth, one of the few heritages, if not the only one, that can be manipulated. The teeth develop in from the seventh to the sixteenth weeks of fetal life. The physical condition of the mother and the diet during the period of gestation will decide largely whether the child will or will not have good teeth for the rest of his life. When the child is born, he has laid down within his little jaws part of the enamel of fifty-two teeth. If this is well developed, without flaws and defects; if the child is well nurtured and properly cared for, he will probably have little dental trouble. What has this to do with diagnosis? Everything. Many times, the dentist detects the pregnancy before the woman is certain of it herself. Many times, he is the first doctor consulted about the pregnancy. Mothers may come to the dentist for advice regarding prenatal care. Often, they are sent by the physician. Who should know more about this than the dentist? Is it fair to let women go through pregnancy with abscessed teeth and pyorrhea? Is it fair to jeopardize the health of the expectant mother and the welfare of the child because of lack of interest on the part of the dentist?

Physicians may ask the advice and assistance of the dentist in the care of the child's mouth, and expect him to be informed on everything from care during teething to the treatment of the various types of stomatitis, thrush, and Vincent's infection. It is not difficult to obtain information on the care and feeding of the baby with special reference to the teeth. Even the Treasury Department, through the United States Public Health Service, will send the dentist, the mother or the physician considerable free literature

Illustrative roentgenograms.

Illustrative roentgenograms.

which will make the work much easier.

As the child grows and develops, there comes the question of the early detection of conditions requiring orthodontic treatment. There are probably forty different reasons why teeth are irregular. Among these are mouth breathing, adenoids and thumb-sucking; and even if their detection is out of the dentist's field, the injury following will have a most disastrous effect on the mouth and teeth. Irregularities in teeth should be detected and treated early for the best results. Early treatment occasions less pain, sorrow and suffering, the expenditure of less time and less expense and affords inestimably better results. Early orthodontic treatment pays remarkable dividends in appearance, health and well-being. If the dentist is not interested in orthodontia, he should be fair with the patient and refer him to a competent orthodontist. The duties which are the outgrowth of the much used and abused term "ethics" are, in my estimation, three-fold: (1) duty toward the patient; (2) duty toward yourself, and (3) duty and obligation to the profession and to the public.

In my early experience as a general practitioner, I was keenly interested in physical diagnosis. I studied Cabot's textbook, studied the physique of the patient as he entered the door, the head, face, body, gait, the color of the skin. We were taught to look for the Argyll Robertson pupil, to become suspicious of gallbladder involvement in patients with large abdomens; and, in this connection, we learned that these patients were poor subjects for gas anesthesia.

At the present time, much emphasis is placed on endocrinology. It is interesting that a still little-known subject should come in for a reasonable amount of time and discussion. Sufficient study has been made of the endocrines to establish, with reasonable certainty, their functions and the control of their behavior. This applies particularly to the hypophysis, the thyroid and the gonads. There is no doubt that the teeth are profoundly influenced by the endocrines and by metabolism, which, in turn, is influenced by the endocrines. Naturally, then, the origin, growth and development of the teeth are influenced by the endocrines. Dystrophy, malformation, malposition and the general texture of the teeth themselves are, in my opinion, at one time or another directly or indirectly profoundly influenced by the endocrines. This again emphasizes the fact that it becomes the duty of the dentist to be on the lookout for disturbances of this nature in order that early treatment may be instituted; for it is only by the very earliest care that relief may be expected.

Many times, by observing the odor of the body and of the breath, we were able to detect pyorrhea, Vincent's infection, diabetes and nephritis before the actual physical examination was made. Patients might come in with apparent objective symptoms of such diseases as heart trouble, tuberculosis, nephritis, tonsillitis, adenoids or goiter. By referring them early to competent physicians, we have won the everlasting gratitude of many of these patients.

One might talk at length on this phase of diagnosis, but, to get closer to our own field, there are the blanched, pale, pallid lips which at least suggest anemia. They may also give a suggestion as to the possible degree of hemorrhage that may have taken place. We should be on the lookout for rhagades and the scars of syphilis at the corners of the mouth, and should observe any mucus patches, herpes (especially if persistent) and chancre, usually associated with early glandular involve-

ment. Bloodgood reported that, in a large series of cases of definite cancer around the mouth and tongue, 20 per cent of the patients had consulted dentists for extraction or other dental work before the malignant lesions had been recognized. This is a rather severe indictment against the carelessness of the dentist in the matter of diagnosis.

As this is a meeting of dental men in general practice, I have purposely confined my remarks to strictly dental conditions. And as the members of the dental profession are the logical custodians of all the conditions of the mouth until stomatologists are trained as such, I wish to remind you that, with privileges, come responsibilities. When you go back to your offices, you will take more pains to find trouble in the mouth, and you will realize again and again that failure to detect is more often due to the fact that you do not look than that you do not know.

As the medical man does not know so much about stomatology, there is a constant tendency on the part of his profession to minimize the trouble caused to the human mechanism by dental disease and other disease-producing pathologic conditions of the mouth. This places an added duty on the dentist, and he must find infection, if possible, in the mouth of his patient, as a lawyer would say, "on his own motion." The patient and the physician should be informed by the dentist of the diseased condition. It becomes his duty to educate the medical co-workers. They must be encouraged to be on the lookout for oral infection and to weigh and consider it in the rightful proportions.

How many times have we seen patients desperately ill, going through clinic after clinic without even a thought or a pretense of an oral examination and diagnosis! Even if a diagnosis is presumed, what does it amount to? When a patient goes to a hospital, a clinic or a physician's office, he gets a thorough examination, which includes everything from percussion to the determination of the hemoglobin index. When a patient comes to the dentist for an oral examination, what does it amount to? Do we take a peek, or merely a squint, tap a tooth or two, hunt around with an explorer for cavities? Or do we presume to make as thorough a diagnosis as our medical friend? It is usually in our power to find the trouble if we look for it.

A physician would not attempt to make a physical diagnosis without having the patient undress. Why? So that he can see. How is a dentist going to make a diagnosis of the teeth unless he takes the covers off and looks at them? Roentgenograms will reveal conditions that are not apparent to the naked eye. How often does the dentist use the roentgen ray? How often does he use transillumination? Yet, how else does he expect to get inside information about the teeth? All the methods combined are not entirely efficient. Medical men will say that there are some cases in which the diagnosis cannot be made even if all the known methods are used. Personally, I feel that, at times, this may be true of the teeth, mouth and jaws. But, in most cases, the diagnosis is not difficult. The peculiar, the difficult cases do not often come to our attention, and here I am reminded of the instructions of the War Department to medical officers regarding transfer of patients who need treatment by a specialist who has access to special equipment (general hospitals): Such a transfer is not a reflection on the ability of the medical officer, but rather a credit to his good judgment.

It probably is impossible to make a thorough examination without some definite system, but whatever method is used, it should involve a complete inspection of the mouth so that nothing is taken for granted. Every corner, every tissue, every organ, every surface should be examined. A swollen gland, which may or may not be painful, may tell volumes. I usually tell my patients that I get a bird's-eye view first, and if anything special is noted, I go back and study it more closely.

It is not my purpose in this discussion to speak of the differential diagnosis of the many diseases of the mouth. A whole period might be given to the discussion of the diagnosis and treatment of almost any one of the several diseases. But it is my present purpose rather merely to encourage the hunt for trouble in a methodical, scientific way. A systematically kept record of the findings in unselected cases will become valuable as a foundation for more thorough and better work. It will give a basis for follow-up work in a given case and prove valuable for comparative study.

From my personal records, I have made 100 lantern slides illustrating pathosis in the mouth and the etiologic factors in the history of periodontoclasia. Each of the cases had been diagnosed by from one to a dozen physicians, and by from one to half a dozen dentists, and had been declared free from oral infection, or had had no oral diagnosis whatever. After vigorous search, infection was found in the mouth, and after it was eliminated, the patients recovered.

SUPPLEMENTARY TECHNIC FOR THE MANDIBULAR INJECTION*

By F. G. GARCIA, D. D. S., Rio Piedras, P. R.

THERE is nothing that contributes more to the success of a dentist than his ability to perform dental operations without pain, and it is true that the correct administration of a mandibular injection for dental operations calls for an exacting technic. It is my purpose in this paper to present a supplementary technic for this work which will greatly assist the dentist in his regular anesthesia work.

There are so many points to be considered that I shall deal only with those absolutely necessary for the success of it. I must state at the onset that practice in the administration of this injection, together with a close observation of the technic, is the most essential point for success, as the most complete technic is liable to fail in the hands of those who do not keep in mind these two points.

We know from experience that the greater percentage of patients coming to our offices for extractions cannot be classed as presenting standard cases, for we know that mandibles differ in size in different individuals, that the angle at which the patient opens the mouth is not always constant, that the anatomic land-

*Read at the annual meeting of the Porto Rico Dental Association, San Juan, P. R., Dec. 16, 1928.

marks vary a great deal and that there are many other points which we must take into consideration.

In order to overcome all these difficulties, I have developed a technic for this injection involving, first, the use of internal landmarks and secondly, the use of external landmarks.

I shall describe first the injection for the left side, and in doing so, I shall not mention any special instruments, etc., as it is my purpose to deal only with the technic for the injection.

Fig. 1.—Measurements to determine depth needle must be inserted.

TECHNIC

1. The width of the ramus of the mandible is determined by placing the bulb of the thumb over the anterior border of the ramus and close to the angle, and the bulb of the index finger over the posterior border of the ramus at about the same height. In this way, the approximate width of the ramus can be obtained, which is very important in determining how deep the needle must be inserted. The height of the ramus is determined by placing the bulb of the thumb over the head of the condyle and the bulb of the second finger over the angle of the mandible. Then, with the aid of the index finger, the median distance between these two points is located. Generally, this corresponds to a horizontal line running through the junction of the upper two-thirds to the lower third of the lobule of the ear. (Fig. 1.)

2. With the index finger, the internal oblique line of the mandible is located.

Fig. 2.—Measurements to determine point of insertion of needle.

This is done by running the finger over the occlusal surfaces of the lower molars, and then moving the finger backward until the bone is touched. If there are no molars, the medium height between the crest of the lower alveolar ridge and the occlusal surfaces of the upper molars is located, and you will notice that it corresponds to the deepest point on the internal oblique line. This point corresponds to the height of the horizontal line

of the external landmarks described above. (Fig. 2.) The index finger is allowed to rest over the line located by the second finger, touching the posterior border of the ramus. The index finger is stretched across the face over the horizontal line thus determined. (Fig. 2.) Then, with the thumb, the greater depression on the internal oblique line is located, and we have obtained the point for insertion of the needle.

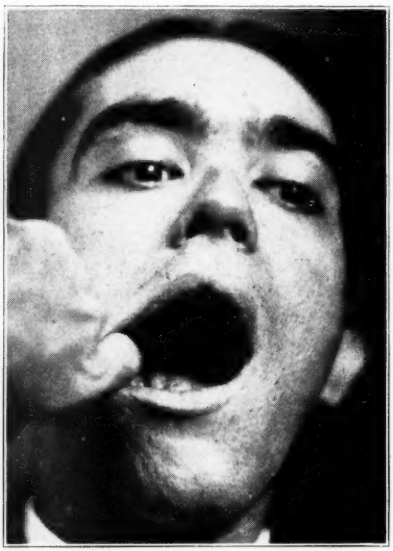

Fig. 3.—Technic for injection on right side.

The syringe is held as if it were a pencil, the operator standing in front of the patient, and the needle is inserted at this point, the operator observing that the long axis of the syringe is parallel to the alveolar process. As soon as the point of the needle has passed the internal oblique line, which is usually after insertion of one-half inch of the needle, from 8 to 10 drops of the solution is injected to anesthetize the lingual nerve. Then the needle is inserted slowly, the barrel being moved slowly across the opposite side until it reaches a point in the area of the first or second bicuspids. You will notice that the needle strikes the bone as soon as it has been inserted the distance calculated by means of the external landmarks. It is very important to keep the index finger stretched across the face and to direct the point of the needle as if to touch the bulb of the index finger. Once we have struck bone, the needle is moved back a little, and about 1.5 c.c. of a 2 per cent solution of procain is slowly injected. It is very important that the plunger of the syringe be worked with a light touch, as in this way we can determine whether we are making the injection in the right place; for if we notice resistance to the injection, we know that we are infiltrating muscle tissue and the injection is going to fail. This is very important in the avoidance of trismus.

TECHNIC FOR THE INJECTION ON THE RIGHT SIDE

The external landmarks are determined as for the left side. We shall see later that these marks are maintained in a different way. (Fig. 3.) The internal oblique line is located with the index finger, the second finger being stretched across the face in such a way that the two fingers will look like the blades of a pair of scissors. The needle is inserted as on the left side.

The use of external landmarks is very helpful, as many of the cases that call for extraction are abnormal.

With this technic, we must, in addition, study the development of the anesthetic condition, taking note of the time elapsed since the first injection and the appearance of first symptoms of anesthesia. In patients of from 8 to 10 years, the first signs should appear on the lip

in from one minute to one and one-half minutes from the time of injection; in patients of from 10 to 30 years, within three minutes; and in those over 30, sometimes five minutes is required in extreme cases. Having this in mind, we can tell whether the injection has been properly administered. We can safely state that, in those cases in which anesthesia does not start within the first five minutes, there will be postoperative pain.

An infallible sign of successful anesthesia can be obtained by leaving the patient alone, when you will notice that unconsciously he endeavors to spit, and, in doing so, there is a holding back of the lower lip, which causes quite an inconvenience in spitting. Mandibular injection increases salivation.

Always have in mind that injection must be done slowly, for many cases of fainting are the result of too rapid an injection.

SPIROCHETES AND FUSIFORM BACILLI OF THE MOUTH*

By THEODORE B. VON BEUST, D.D.S., M.D., Louisville, Ky.

THE study of oral micro-organisms presents difficulties of a peculiar type. With most of the infectious diseases, it has been possible, with the aid of cultural methods and the use of the microscope, to establish not only the etiology but also the complete morphology, general biology and pathogenesis of the associated organisms.

Unfortunately in the case of mouth lesions, the facilities for bacteriologic study are, up to date, only of limited usefulness. We see in a smear from Vincent's infection not one or two but a great variety of organisms. Attempts at classification into types are almost impossible because organisms which we think that we can recognize as a morphologic variety, on closer inspection approach one another so very nearly that misgivings befall the conscientious systematician. Neither do the difficulties end here; for the specifically oral micro-organisms, I am still led to believe, fail to respond to measures taken for their cultivation.

I am here speaking reservedly, for a number of investigators have claimed success in the cultivation of mouth forms; both Goadby and Kligler and, more recently, Jay, claiming positive results in the cultivation of *Bacillus buccalis-maximus,* and Ruth Tunicliff, Repace, Ozaki, Rodella and Krumwiede claiming success in the culture of the fusiform organisms. Muehlens, in addition to growing the fusiforms, also claims to have grown *Spirochaeta dentium.* Nevertheless, in view of the fact that none of the mouth forms have been sufficiently described, I am inclined to doubt the identity of the

*From the Research Department of the School of Dentistry, University of Louisville.

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cultivated forms with those seen in the smears.

There is yet another reason for this skepticism. It is the occurrence in the mouth of the peculiar modes of propagation first described by Vicentini and later by J. Leon Williams. To these, I shall refer in some detail near the end of this paper. Disregarding for the moment these two reasons, I might add that the forms grown by Tunicliff, which have attracted more attention here than elsewhere, do not look at all like those seen in smears. The same objection may be applied to those grown by Muehlens.

Further uncertainties exist concerning the etiologic significance of the fusiform bacilli and spirochetes of Vincent's infection. Sufficient proof has not yet been advanced to convince many German and American observers of their relation to the lesion. In addition, cocci, or coccus-like organisms, frequently appear in the smears and vie with the fusiform bacilli as causative factors. Be that as it may, it appears appropriate to deplore the questionable practice of loosely speaking of a Vincent spirochete, or, as I shall demonstrate, of relying on the microscope for the diagnosis in suspected Vincent's infection.

At the outset, it should be emphasized again that we do not know the real cause of Vincent's infection. Neither can the spirochetes present in Vincent's stomatitis be differentiated from those existing in what Gottlieb calls a filth pyorrhea when stained by ordinary laboratory methods. A long familiarity with mouth smears has forced me to such a conclusion. Very recently, in order to learn whether I was mistaken in this regard, I selected for study smears from cases of undoubted Vincent's infection, from pyorrheic mouths and from mouths which, judged from the standard of numerical prevalence, could be called normal. The next step was to make camera lucida drawings of all of the organisms associated by various authors with Vincent's infection. To exclude any modification through personal bias, the drawings were duplicated by an assistant, a hospital employe who did not share my skepticism in the matter.

To summarize the results of our comparison, it may be said that no points of differentiation are apparent between the smears, except that, in one slide, the spirochetes occurred in thick and thin varieties. This discrepancy occurred in a slide from a normal mouth and thus can have no bearing on the problem. The size, number of windings and other features visible with the stain used intergraded so intimately that form types, such as *Spirochaeta dentium* (Miller), *Spirochaeta media* (Hoffman) and *Spirochaeta buccalis* (Cohn and Miller), could not be segregated. These remarks apply to preparations made with cold or hot anilin stains, such as are commonly used in diagnostic work.

This examination is not intended to refute the view that more than one variety may be domiciled in the mouth. We know that well defined types exist in human ailments, some of which have really been cultivated; for instance, *Spirochaeta pallida,* with its numerous windings, first grown by Schereschewski. This form can readily be differentiated from the mouth spirochetes morphologically. Then we have *Spirochaeta icterogenes,* the spirochete of Weil's disease, cultivated by Ungermann, which can be differentiated experimentally. *Sp. obermeiri, Sp. dutoni, Sp. berbera* and *Sp. carteri,* belonging to the relapsing fever group, can also be grown, but only with the greatest difficulty. All of these spirochetes, excepting *Spirochaeta pallida,*

closely resemble forms that we find in the mouth.

Although spirochetes may be found wherever an invasion from the mouth cavity is possible, for instance, in the lungs, tonsils, nose, maxillary sinuses, tooth pulps and, what interests us especially, in apical abscesses, their structure, from which alone the identity of the oral forms with those obtained in cultures can be judged, has not been sufficiently characterized. An investigation that would fulfil reasonable requirements for a comparison would necessarily include means for determining the occurrence and type of ciliation, undulating membranes, periplast processes, cell inclosures, reactions to various stains and modes of reproduction. In regard to the last item, it will be recalled that Vicentini claimed that the spirochetes were derived from other mouth forms. (So far I have found no indication of such an origin.)

The foregoing remarks, you will please understand, are directed against the belief that a so-called Vincent's spirochete can be differentiated with ordinary laboratory stains and furthermore against the view that a type of spirochete that is peculiar to Vincent's infection exists.

If the procedures applied to the spirochetes are extended to the fusiform organisms, the resulting observations prove equally confusing. At present, a concrete description that will fit the fusiform organisms is lacking. Vaguely, we imagine a pointed organism, thickest in the middle; but when we follow the descriptions published by various authors, we learn that they may be long or short, thick or thin, straight or curved and blunt or pointed. To add to the confusion, they are by some described as gram-positive; by others as gram-negative. Even so, strange to relate, in practice we find, in each mouth smear, organisms corresponding to any of these opposing descriptions, yet on which we may look with a reasonable degree of confidence as belonging to the fusiform bacilli.

In recent years, observers have realized that fusiform organisms are present in pyorrhea. I have emphasized this fact in former publications. Notwithstanding this known view, it is common practice for dentists to rely on microscopic examination for the diagnosis of Vincent's infection. Such a course embodies an incongruity. It has been argued that the number of organisms present may serve as a criterion. This is erroneous, for a slide may literally be covered with fusiform bacilli and spirochetes from a single pyorrheic interdental space.

I have observed, drawn and photographed these organisms for years, yet I am unable to differentiate Vincent's infection from filth pyorrhea by the organisms present in the smears. Possibly others can do so. Of course, if a dentist presents a smear with the statement that the material was removed from superficial erosions of the mucus membrane, or he mentions the occurrence of a foul odor or inflamed submaxillary glands, headache and fever, the diagnosis, if we exclude mercurial stomatitis, is obviously Vincent's infection. The mere presence of large numbers of these organisms on a slide without specific information proves nothing.

Even granting the etiologic connection of the fusiform organisms with the lesions, I repeat that the organisms from the relatively mild pyorrhea cases and the highly virulent Vincent's cases cannot be differentiated from one another in the stained preparation. Vincent's infection of the gums, then, in the present state of our knowledge, is merely a condition characterized by an invasion of the mucous membrane by normal mouth

inhabitants which have forsaken their haunts in the subgingival spaces for an onslaught against a weakened host. These remarks are the equivalent of the claim that the microscope is of value only where it appears desirable to establish a very improbable participation by rarer germs, for instance, by *Oidium albicans*. In diphtheria, the microscopic examination would hardly come into consideration, as this condition is more accurately diagnosed by the cultural method.

In a paper recently published,[1] I endeavored to demonstrate that the fusiform organisms, in addition to their known multiplication by fission, also utilized a second mode of propagation which I have regarded as a form of sporogenesis. Whether this term should be applied only in a modified sense, future developments will show. In the meantime, I shall simplify matters by stating that fusiform organisms grow on stalks, forming heads, somewhat resembling in appearance the spikes on some grasses, with the difference that the whole stem may become covered with the growing bacilli. This is the mode of propagation utilized by *Leptothrix racemosa-vicentini*.

Until this, or an analogous mode of development, has appeared in the cultures of those who claim to have grown the mouth inhabitants, a doubt must hover over such assertions.

1. Von Beust, T. B.: Morphology and growth of Fusiform Organisms, J.A.D.A., 16:714 (April) 1929.

RELATION OF THE EXODONTIST TO GENERAL DENTISTRY

By JOHN W. COOKE, D.M.D., Boston, Mass.

EIGHTY per cent of your work comes from general practitioners. You see our patients and they return to us. Regardless of our personal opinion of you, the volume of work you receive from us depends on what our patients say and think of you. You do not have to "sell" the dentist: that has been done for you, or he would never send you cases. But you have a never-ending life-time job in selling the patient. None of us should ever lose sight of the fact that we owe our living to a group of human beings and not to exhibits on models.

If the general practitioner knows his job, he will be the first person to hear of your success or to share in your failure. It is with the idea of helping to make rare failures even rarer that I have prepared this paper.

An unfriendly view of the modern dental situation is revealed in the statement that 50 per cent of American dentists are good technicians but poor psychologists. An equally unfriendly attitude will reverse the opinion and say that the other half are excellent psychologists but hopeless technicians.

It is true that the men who are able to capitalize their knowledge of human beings are the ones who enjoy the biggest material success, regardless of their

*Read before the American Society of Oral Surgeons and Exodontists, Minneapolis, Minn., Aug. 17, 1928.

respective abilities to deliver results. This may be due partly to the fact that some do a little and make their patients like it, and partly to the fact that poor dentistry at the time is the easiest kind of dentistry for the patient to bear.

Somewhere between these two extremes lies a position which is sound for everyone, particularly for a specialist in dentistry. Your organization as individuals is placed in the public mind as a group possessing extraordinary technical skill. If this were not so, you could not continue long in your specialty. Whether your specialty or any other commands a preeminent position because of attached technical difficulties is not for discussion here. The fact remains that allied brethren in a surgical field are believed by the lay public to know things and do things that the average practitioner is incapable of accomplishing. This is hardly a criticism of your field: that some of the rest of us are not so fortunate is simply our hard luck.

It is unfortunate but true that business success in dentistry depends not so much on the quality of dentistry as on what the patient thinks of the dentist. The patients usually know nothing about their mouth conditions, except that they are comfortable or uncomfortable, and either the dentist hurts them or he does not. The type of patient who expresses a keen interest in what is being done or who is inclined to dictate is rather rare in my community.

If it is true that success in dentistry does not lie in operative effort, it is doubly a fact that a definite effort should be made to hold desirable patients by any legitimate means. The personality of the operator can be made to fit the personality of the patient. It will be found that one's ideas of dental technic must be made as flexible as the various types of patients who present themselves for care. Patients as a rule are not susceptible over a wide range to any great change in their settled ideas. If a great change takes place, it must be accomplished gradually. The possibility of pursuing a course of treatment which satisfies the operator, even in young people, may be greatly tempered by the settled ideas and convictions of the parent, whose conceptions of dentistry may antedate ours by many years.

To put the problem another way, patients will go where they can get what they think is right. Success depends not so much on how closely one adheres to ideals, but on how best one can fit these ideals into those of the patient with the smallest possible amount of friction and loss of his or her time.

I believe that in your field you are better technicians than those in other branches of dentistry. You are certainly much more positive in execution and your results are more clearly defined. Therefore, for the purposes of this discussion, if you have a problem related to general dentistry, and I think you have, it is not technical, at least to the extent that a general man can be of material assistance in helping with its solution.

The specialist has done splendid work in perfecting operative and merchandising technic for the unusual case. Impactions of whatever nature, root resections, etc.—these are considered unusual occurrences. I think that they may sometimes lose sight of the possibility that their patients cannot always differentiate between the routine and the unusual, and that the smooth handling of a routine case may reflect just as much credit on their skill as the building up and successful operation of a very delicate impaction. The degree of severity is something that can interest a lay pa-

tient only a little. To the patient a tooth is just a tooth. A reason for the patient's ability to differentiate lies in our attempts to show that all exondontia is not identical and that different cases present varying risks.

Surgical procedure for a well person presents only technical difficulties. Yours are largely office practices, and if ambulatory patients may be classed as well, a majority of dental patients are well. Physical correction, up to a certain point, ought to be simple for any capable operator. Mental control, to the point of complete confidence, is something different and by no means so easy. Comparatively few general medical and surgical patients are well. Equally few dental patients are ill, and those who are may usually be handled without technical difficulty or mental disturbance. I think that our medical colleagues know very little about health; we know as little about disease. This may furnish a reason for some rather wide differences of opinion as to the part played by health in focal infection.

The well dental patients, in the great majority, generally display the doubts and fears that accompany a contented mind and a body free from pain, neither of which desire to be disturbed, or even to be temporarily inconvenienced. This is one reason why dentistry is annoying for everybody.

We control our practices beyond the point of active complaint, but it is doubtful that any of our patients improve mentally beyond a stage of passive resistance and irritation that things have to happen to them.

Even as general practitioners, we enjoy some points of advantage over you specialists. We are supposed to control physical aspects of dental trouble; if, after a fair trial, we cannot gain the patient's confidence, irrespective of our technical abilities, it is better for the patient to make a change, and, in most instances, this is what happens without suggestions from us.

The oral surgeon, or exodontist, occupies a position unique in dentistry. His is about the only unit task which is ever complete. Making each tooth a unit, or each operation on or because of several teeth a unit, he finishes his work and it stays fixed. No general dentist ever really finishes anything. Other specialties in dentistry are about the same. It remains for the surgical branch, because of its destructiveness alone, to remove something completely and to finish permanently a piece of work.

While the apparent finality of your work looks encouraging, it has a few features which make me rather glad that I have no aptitude for it. You have one chance, and one only, to merchandise your ability and personality to each patient. If you fail, your first chance is your last, and some other exodontist has the pleasure of caring for that patient in future emergencies. Of course, you have few failures, but I prefer to look at every case as a potential failure. The occasional patient who retires from the scene leaving us defeated becomes a matter for reflection as to what has been done wrong, and as to what change may be made in approach to keep the same thing from happening again.

From the standpoint of general dentistry, an operation for impaction, well done and at the proper time, might just as well be in the knee as in the mouth. If there is no injury to the second molar or surrounding tissue, there is no repeat order on or because of this tooth. But, break a good arch at any point and, sooner or later, you may be asked to return to this point to do some more

surgical work and widen the original space. I think that this situation is significant for the future of general exodontia. The case which may return deserves some attention.

Our dental equilibrium is much more static than dynamic. We are becoming accustomed to apparent success. We have imitated notable dentists and are traveling far on the momentum that they created. Technically, we are limited by the human element. Physical overexertion, physical shock, must be avoided. There is no excuse for performing a difficult operation just because it is difficult. There are times when, as a profession, we may be open to honest criticism as to the good attained by certain of our procedures. What percentage of success makes a bit of technic practicable? Should a difficult third molar be removed, when the extraction of a poor second molar, which should be lost soon, will clear up a definite condition? To search for easy things opens the door to carelessness, but I really think that we have specialized our dental efforts to a point where it is hard to see a solution for any problem except the hardest one.

Many patients are referred to an exodontist because the general dentist does not know what to do for them. The cases in which dentist and exodontist sit together in serious consultation regarding rational general diagnosis are conspicuous by their absence. If any one should be qualified to make an intelligent oral diagnosis, it is the exodontist or oral surgeon. He knows no patient well enough to allow his judgment to be faulty through friendship or affection. It must be a rare instance when he can do more than be a little selective in the diagnosis of the cases which are referred to him.

If I refer a patient to you for general diagnosis and operation, how do you handle it? Suppose the patient has eight pulpless teeth, four of them anterior, showing a little apical disturbance. I might start an endless argument over the meaning of the term "little." He has four pulpless first molars, showing approximately similar apical conditions. If a physician refers the patient, it will be for the removal of every possible mouth focus. In a majority of cases referred by a dentist, the anterior teeth will be watched and the molars removed, with about as much logic as is employed by a board of health which releases the male member of a quarantined family for economic reasons.

Safety—to the exclusion of possible error—is not possible in handling exodontia cases from general practice. If the general dentist thinks consistently, he will realize that his main professional function is to save teeth, and not to create opportunities for plates and bridges or what have you.

Teeth constitute one body element, possibly the only one, not possessing the property of spontaneous repair. They have a few protective functions, but constructive repair and destruction is left to the dentist. Please note that I say repair first. It seems illogical to me to remove functional teeth as a preventive measure. What meager therapeutics we are capable of should be attempted before any destructive measures are tried. A tooth, any tooth, should be kept in the mouth just as long as it is useful and safe, and if we cannot control the problem sufficiently to prevent pulp involvement, we must learn practical root canal therapy sufficiently to avoid failure. That you may remove teeth ten years after we treat them is simply an argument in favor of retention during the

useful years, which must be made safe. I do not intend to be technical and do not wish to start another argument as to what is "safe."

Many times, we are not certain whether we run our practices or our practices run us. I note an occasional keynote in articles and addresses, dental and otherwise. "The public demands this, the public expects such and such dental service," and so forth. Strictly speaking, there is no demand for real dental service which we as a profession do not originally create and later carefully foster. Some people are conscious of requiring something, but what it is they are not certain. Patients want relief from pain and inconvenience, and may be led by us to a point where real dentistry in the shape of early recognition is conceivable. The extent to which we go toward reaching an ideal depends on the progress that we can make with patients in convincing them that our position is logical for them.

Now, as regards this logical position, for the patient, what definite views regarding general mouth diagnosis do you possess to guide the general man in his course of action? The shoe has been on the other foot, quite mistakenly, but your basic opinion should be the guiding factor in helping us. Are you asking of the general dentist and of yourselves, "What should this patient have? What may be done in the best interests of this patient?" Or in common with a great many of us, are you first finding out "What does this patient want?" The patient intends to get what he wants as nearly as possible. He may be mistaken in what he thinks he wants, and it is part of our task to convince him of this.

We have been very inconsistent in our attitude regarding pulpless teeth and focal infection. We started at one extreme twelve years ago, or rather rushed to that extreme, and we are now rather floundering in uncertainty as to where our former convictions have led us. We believed that we knew what the patient then should have. We are beginning to wonder now just what it is that the patient wants.

A history of everyday occurrences seldom gets a first page location in a newspaper. There is small mention of general dentistry, because the special field has claimed many a general dentist and specialties are new and general dentistry is old. Even general dentistry when writing for publication features the unusual. The only really valuable permanent contribution that a general dentist can make is in dental health education, and we are defeated so often in our attempts at that that we feel a little hesitant about mentioning our few successes.

We enjoy reading reports of extraordinary technical accomplishments in dentistry. The names connected with individual achievements of great merit are synonymous with modern dentistry. But if the field of the exodontist were limited to surgical correction in preparation for these unusual and rightly advertised cases, there would be little done. A reputation may be made or broken on the basis of one important case, but the office help is paid and one's net income assured by virtue of routine business, largely from general practitioners in dentistry, where the unusual is as rare as it is unwelcome. I would support any conviction that the patient should be informed of unusual difficulties, but I must still remind myself that, as far as the average patient is concerned, the specialist's reputation may be injured just as much through faulty psychology during routine extraction as by technical failure during a very difficult case. The

general dentist is too apt to pass the responsibility to the exodontist by reassuring his patient as to the simplicity of an operation, which both he and the exodontist may realize to be far from simple. It is far easier to express surprise that an experience has resulted favorably than to find reasons for complications which the patient has been assured would not ensue.

Quantity production and crowded practices are errors in dentistry. That they exist makes them none the less errors. Dental merchandise is similar to any other, being marketed and bought not primarily on its intrinsic merits, but on what the customer is made to think of it.

Merchandizing is a mental not a technical accomplishment. We are responsible to ourselves for our technical attainments, and dependent on our patients to present opportunities for us to put across to them what we know in a manner in which they will accept it and ask for more.

An article need not be expensive to manufacture in order to command a high price. In fact, many articles of definitely low money value are marketed at a tremendous profit because the buying public has been thoroughly merchandized to appreciate and ask for it.

No dental discussion is ever complete without reference to fees. The position of the specialist regarding money is psychologically perfect. His status is established for him, especially during this era when the idea of specialized service has been most completely merchandized. There is, I think, one point which most of our dental economists have not considered it worth while to stress. Granted that a good case merits a special fee, it cannot be uniformly secured by technical skill alone. The patient requires of us almost as much effort to build him up economically with a fee in mind, as is required sometimes to lead him toward the realization that one tooth may be harder to remove than another.

We have still with us the generation who remembers when $10 would buy almost anything in dentistry. I recall the horrified tones of a patient who a short time ago told me that Jim Jones had charged a friend of hers $75; Jim, by the way, being a good exodontist. I expressed my interest by asking her what the $75 was for. She displayed total ignorance of what had been done but expressed the opinion that $75 was an exorbitant fee for anything in dentistry. Her husband is a very successful general practitioner in medicine who dabbles quite profitably in uncomplicated obstetrics.

The general dentist who refers his exodontia and oral surgery cases should know the fee range of the man who does this work for his patients. He should consider it a part of his obligation to both patient and exodontist to help in fixing a fee fair to both. I have heard the comment that there was small justice in a system which permitted the specialist in dentistry to receive more for five minutes' work than the general practitioner receives for an hour's work. That this is often true is up to the general dentist. It will be a difficult matter for dentists to forget the time system of arranging fees. Possibly they should not forget it; but it is certainly not to the point to suggest that exodontists and oral surgeons remove teeth by the hour.

A practice in dentistry is always an unpleasant affair for patients. It always entails, if not actual pain, certainly discomfort and a succession of irritating details. Although its severity is much less than during earlier days, the actual

dental work will always be an operation to be avoided and dreaded by the one who is to have it done.

We can minimize the amount of necessary dental work by intelligent care and useful cooperation, but it is a fact that the most minor of dental operations may cause extreme discomfort. As dentists, we are in dentistry to do the most possible good for our patients. We are also frankly concerned to do the most possible for ourselves.

I must be able to make some favorable impression on a patient, aside from any opinion he may form concerning my professional ability. This is a very difficult status to define, but I think that an attitude of interest in nearly anything the patient may wish to speak about will serve as a starting point. I do not believe in vocal dentistry, but a moment or two at the start of an appointment can well be devoted to letting the patients realize that I am interested in a friendly way in something besides their names and their teeth. For example, if I know the patient to have been facing some small problem with a child, it creates a good impression to express a hope that matters have improved. I am sure that I have my facts at hand, if I do any talking at all.

I have at my command some very complete records of what I have attempted for my patient. If I cannot remember offhand what was done, I refresh my memory before meeting my patient. The patient may remember roentgenograms which have not been reported on. I will maintain his belief in my interest if I mention this before being reminded of it. If my previous appointment with a patient was noteworthy for some success or even for some conspicuous failure, I lighten my future burden if I give them credit for their part in my success or compliment them on their patience when I failed. It is difficult to outline the place when one does not use sufficient psychology, and the point where one overdoes it. At the very least, let us make the attempt to lead every patient to remember us pleasantly by some small act of courtesy or by some helpful remark.

In this connection, we should pick our cases. The nervous, frightened woman may appreciate our attendance into the reception room and to the door. We may even be solicitous to the extent of helping her with her wraps; while the scared boy may many times be successfully handled with a slap on the back and some encouraging remark. Remember that even if the patient imagines some sensation, whether it is pain or pleasure, it is a fact as far as the patient is concerned. If the patient thinks that I am a wonderful dentist, she will do so more through my ability to cope with her temperament than through any technical ability that I may have.

If we are obliged to undergo an unpleasant experience, we want to see it become history as fast as possible. Put yourself in the patient's place. Everything that is done for them in a dental way, they hate. We are obliged, by our conscience, to do our work thoroughly. We are equally responsible to the patient not to prolong a given operation more than is necessary. If we have a certain time to do a piece of work and can complete it in half the time, we are doing neither the patient nor ourselves any good by keeping him longer than it takes to do the work. We all realize that many operations are necessarily tedious and sometimes very painful. We are practicing no deception on our patients if we impress on them continually that we are doing all in our power to

hasten our work to completion. Even if we know that patients are suffering no discomfort, we will usually be wise in agreeing with them and in sympathizing with them.

A general paper is a hard thing to prepare: it must be much harder to listen to. It runs the risk of being so general that it loses all of its possible effectiveness, and it may stress minor details so much that no one can listen to it with interest. Therefore, for the benefit of that large proportion of you whom I am quite certain have been politely asleep during the past twenty minutes, I want to attempt a short summary.

SUMMARY

1. Technically, the surgical field in dentistry needs no suggestions from the general practitioner. I have yet to hear a complaint regarding clinical results from the patients whom I refer.

2. You do not pay sufficient attention for your own good to the simple cases. You handle difficult ones easily because you study not only clinical problems in difficult cases, but the patient as well. You may not mishandle the simple cases clinically, but you do not handle the average simple case skilfully mentally.

3. Dentistry in general, not the surgical branch in particular, needs stabilizing on what are considered important problems. The exodontist gets the end result of pulpless teeth: he should be an important factor in helping dentistry to a logical opinion.

4. All specialists in dentistry need to learn what it is to merchandise service together with professional ability. We require not so much a conscious sense of high pressure salesmanship as a human interest in people. Real interest, if combined with average ability, cannot but show results.

I heard the late Eugene Smith define dentistry a while ago. Every dental operation was performed with the thought in mind that the next thing could be done when needed. All the way from the newly erupted tooth through filling restorations of increasing scope—extractions and a plate. We should consider no personal contact as final, and no operation or problem or person so trivial that it or he does not command our most thoughtful care.

DISCUSSION

J. A. Heidbrink, Minneapolis, Minn.: Because there are so few hours in the day to do the many things some of us have to do besides practicing our specialty, the matter of these little courtesies to our patients and the consideration of them, giving them their true value in the conduct of the practice, has possibly been neglected. Dr. Cooke has hit upon the right chord. The matters that he has presented here are of the importance which he gives to them, and should be followed by us.

J. Franklin Moore, Oakland, Calif.: One thing I would like to mention is the matter of remarks made by our patients when they come into the office, remarks that are deprecatory. A patient comes in and says, "Oh, this is where I get murdered!" I take him to task as we should out of regard for our profession. Sometimes, we will get an apology and afterwards the patient becomes our best advocate.

We would not see so many cartoons regarding dentists if we should take exception to these remarks. We should have more dignity in our profession. These incidents do not arise in the general surgeon's profession, and should not in ours.

H. A. Elmquist, Des Moines, Iowa: I should like to emphasize one point. We exodontists entered the field shortly after procain nerve blocking came into use, and we made a favorable impression on the patient by being able to do the work without pain. We take all of this to ourselves—we have become so used to it. But are we so careful to create a favorable impression on the patient in regard to the dentist who referred the case to us and to their dental work generally?

Rush P. Abbott, West Point, Miss.: As regards the relationship of the general practitioner and the exodontist, the exodontist has a great deal to contend with when it comes to his relationship with the general practitioner.

The latter are sometimes not familiar with the technic of the expert exodontist, and consequently, the exodontist comes in for a great deal of criticism from him, and unjustly so. The time is not far off when the general practitioner of dentistry will have to either refer cases that need scientific care to the exodontist, or he will have to prepare himself to care for them.

Boyd S. Gardner, Rochester, Minn.: We are belittling our simple cases. Patients come to us for the best that we have to offer and everything we do for them is serious, in their minds. If we would only consider this, we would add materially to the value of the work that we are trying to do.

Henry B. Clark, St. Paul, Minn.: I think that we are rather unappreciative of what the general practitioner does for us. When a man spends considerable time in examining a patient and then sends him to us, he has done us a service, and many times, we are, I think, negligent in not making some recognition of this service, either by telephone or by writing a brief note to him. Referring to a very prominent oral surgeon, a general practitioner once said to me: "I sent him a case for which he received $125. He never even said 'Thank you.' I don't believe that he considered me at all." No doubt this was simply carelessness, but if the surgeon in question had merely said, "It was good of you to select me to take care of that case," he would have made a friend instead of arousing resentment.

William Hopkinson, Milwaukee, Wis.: You sometimes neglect to thank the general practitioner although he has taken the time to persuade the patient to come to you. The physician sends the patient to the general practitioner, not to the oral surgeon, and the general practitioner has to convince the patient that he must have the tooth extracted or any other source of infection eliminated. It is sometimes a sacrifice for a general practitioner to give up that particular part of his work, and the surgeon should appreciate it.

Dr. Cooke (closing): One of the discussers stated that there was an obligation on the general dentist either to give up exodontia completely or to perfect himself in the technic. In justice to the patient, exodontia and oral surgery, as done in Boston, should be kept out of the office of those men doing general practice exclusively. Some of this practice might be rather profitable to the dentist, but most of it is hard on the patient. We owe our living to our patients and, once in a long while, at least, we should consider them a little.

CONSIDERATION AND TREATMENT OF THE MOUTH AS AN ORGAN OF DIGESTION*

By B. B. McCOLLUM, D.D.S., Los Angeles, Calif.

THE TEETH NOT ORGANS

TEETH are not organs. They can perform no functions by themselves. A single tooth left in a mouth not only can perform no function, but permits few or no functions to be performed through it. Teeth have value only when capable of being used collectively. Teeth chew as a pen writes. It would be just as sensible to credit the composition to the pen or the picture to the brush as to ascribe chewing entirely to the teeth. But since the teeth are the outstanding parts of the mouth and are the parts

*Read before the Section on Partial Dentures, Crown and Bridge at the Midwinter Clinic of the Chicago Dental Society, Jan. 15, 1929.

making the actual contact in chewing, they have tragically overshadowed the more fundamental factors operating the mouth. It is the live mouth motivated by nerve-controlled muscles that masticates with the teeth. The teeth are chewed with through action of the biotic factors of the mouth. If they are not properly related in form and arrangement to the activating forces, they soon become worn, have their foundations shaken and become unmoored. We must look farther than the teeth to understand their purposes, form and arrangement, most of which should be understood before we attempt to administer treatment.

THE MOUTH AN ORGAN

Several times during the last five years, I have heard it lamented that there is no treatise on dental physiology. There can never be much time given to the physiology of the teeth because, aside from the mouth, they have no function. Therefore, the physiology which concerns dentists primarily is that of the mouth. Until the mouth is integrally considered and thoroughly understood to be the important organ of digestion that it is, it will never be possible to properly administer treatment to its ills and aberrations. The mouth is just as much an organ of digestion as is the liver or stomach. True, it is not so indispensable to the immediate continuation of life but it is as necessary an organ of digestion if the fullness of life is to be enjoyed. That the importance of oral health cannot be overestimated is evidenced by the fact that 70,000 men and women obtain a livelihood by devoting their full time and energy to caring for the teeth and supposedly the mouth.

The anatomic factors of the teeth, that is, the cusps, ridges and grooves, are the means by which the mouth functions as a digestive organ, starting the process of digestion by comminuting food. The cusps, with their ridges and grooves, bear a direct relation one to another, and in this relation are coordinated with the jaw bones, joints, muscles, tongue, palate, lips, cheeks, nerves, reflexes, etc., that make up the mouth. The chewing function may well be called the master function of the mouth, as all of the others are dependent on it and are secondary to it. It is through the chewing function that the mouth contributes most to the maintenance of a healthy body. Good mastication is essential to well-being, a fact everywhere accepted. A healthy mouth reflects good systemic health. It, by being well, induces a general well-being. Any lame member of the body, whether an eye, an ear, a foot or a hand, reduces proportionately the general health of a person. But the mouth, being an integral part of the alimentary tract with a definite digestive function to perform, is of primary importance to the body.

NEGLECT OF THE MOUTH AS AN ORGAN

It is well known that the mouth has been neglected by dentists, physicians and the dental schools. In a vague, general way, dentists have recognized mastication to be a purpose of teeth, but they have never seriously considered the indispensable rôle the mouth plays in digestion. Of the numerous articles attempting to link dentistry and medicine, none of them, including the latest one, by Charles H. Mayo,[1] even mentions the mouth as an organ performing an indispensable function. Physicians and dentists seem to believe that the salivary action is but a feeble factor in digestion and that milling and culinary devices which mangle and shred food outside the

1. Mayo, C. H.: Interdependence of Medicine and Dentistry, J. A. D. A., 15:2011 (Nov.) 1928.

mouth can adequately act as a substitute for chewing. Perhaps they expect the pancreatic enzyme, amylopsin, to compensate for the inaction of ptyalin, which, no doubt, has little influence on unchewed swallowed foods. Persons who eat too rapidly and do not chew well nearly always suffer digestive disturbances, such as heartburn. The dental profession, by focusing its eye and mind on the teeth, has either lost sight of or failed to discover the cardinal and foundation principles of the mouth's action and consequently has never properly understood how to treat its ills and deformities.

Dentistry was cut off from general medicine and surgery because of failure to recognize the importance of the mouth as a digestive organ. Physicians have totally neglected its physiology and have regarded the healthy mouth as nothing more than a remote orifice for the stomach, a place to insert food and drink destined for the stomach.

Every dental college in the world teaches dentistry as though the teeth were organs themselves. They teach operative dentistry through the application of remedies to the carious holes in individual teeth. No definite study is made of the teeth collectively. Nothing is learned about the relation of the teeth collectively to the motivating forces of the mandible and, of course, methods and instruments for measuring the abberations of the mouth are not understood and are practically unknown. Considerable is known about the physiology of the mouth as a unit organ functioning to perform a definite duty in the general metabolism of the body. It is incredible that so little has been taught in the dental colleges about this all important fundamental conception for understanding the physiology of the organ on which we, as dentists, are operating.

NEGLECT OF THE MOUTH

In the diagnostic schemes at some famous clinics, routine oral examination is made only to discover whether the mouth is infected. No attempts are ever made to determine a possible relationship between ill-health from malnutrition, on the one hand, and, on the other, a crippled mouth, which necessarily compels the patient to select and poorly chew a diet lacking proper nutriments. The work of the general surgeon leads him to think destructively because he deals with diseased organs or tissues considered irreparable menaces to the health or life of patients. Physicians, endeavoring to establish health in patients, have, with seeming complacency, permitted or prescribed a surgery which completely eradicates the chewing function of the mouth and have given less thought to the subsequent ill-effects to the individual than to loss of the hair. The medical profession, by fostering the idea of curing people by removing diseased tissues or organs, has encouraged this destructive trend in the dental profession. Dentists, in a great effort to become recognized as an important profession, have made their bid through the back door medium of finding infection in the mouth, extracting some or all of the teeth and shouting to the world that a new cure had been found. The dental profession assumed with gusto this surgical attitude and for some time embraced the belief that at last it had come into its own. But no creditable recognition has been attained, because dentists have not, through their consideration and treatment of the mouth, made it perform its function as an organ of digestion. Dentists have not fulfilled their obligation in health service; and they find themselves treated in a

condescending way by the medical profession and are regarded by the general public as make-believe doctors.

CAUSES OF NEGLECT BY DENTISTS

The foil fillings, inlays, amalgam fillings, crowns and bridges recorded in the hundreds of mouth casts and roentgenograms at hand appear to have been intended solely to stop up a hole in a tooth or to fill up a disfiguring vacant space and not to provide for the function of mastication. This appalling kind of dentistry is done by men lacking an understanding of the basic principles of mouth functions, men who have confined the scope of their view to the individual tooth. In spite of the universal recognition of the importance of the contact points and the contour of the tooth, practically all dental fillings, crowns and bridges not only fail to restore, but also actually obliterate the identity of the tooth. These atrocious and grotesque results are brought about, in a large measure, by the dentist's failure to comprehend the plain fact that a tooth in itself is a helpless, useless member of the masticatory apparatus. The structure and position of the tooth is not important to the tooth itself. It is only when we fully consider the fact that each tooth is not an independent entity but a carefully formed part of a definite organ that the significance and indispensability of its structure and position become plain beyond a possibility of their being misunderstood and ignored. As long as dentists are concerned primarily with a tooth or teeth not related definitely to the chewing motions, there is no reason to expect dental fillings, crowns and bridges to look like dental restorations. Unless the operator has a knowledge of the purpose and the required position and relation of the various cusps and ridges of the teeth, he cannot hope nor should he be expected, to sculpture them into the artificial substitutes for teeth.

GENERAL PHYSIOLOGY OF THE MOUTH

Growth Function.—The growth function of the mouth is of especial importance to orthodontists. The conditions promoting or retarding growth of the jaws are yet to be discovered. The eruption of the teeth has been given as a promoting factor in growth of the mouth and the too early loss of the deciduous teeth as a retarding factor. I have seen three cases in which most of the permanent teeth were congenitally missing. Most of the temporary teeth were lost several years later than usual, but for some time they offered no support or pressure to promote growth. In spite of the almost complete absence of permanent teeth, all three individuals had well developed jaws and faces. I have nearly complete records of the latest case observed.

Secretory Function.—The secretory function of the mouth connects it directly with the process of chemical digestion. We should get our knowledge of the chemical action of ptyalin from the physiologist who makes biochemistry his problem. He has demonstrated that comminution of the food and the mixing of it with saliva, with its ptyalin and mucin, increase the action of all other digestive juices, and it is doubtful that complete digestion can go on without thorough mastication. The secretory function of the mouth cannot work well unless the mouth can chew well.

The general chemical action of the fluids of the mouth and their influence on the health or disease of the teeth and other tissues is little known. Why do the teeth decay? If it is a bacteriochemical process, why is the proximal portion of one bicuspid or molar completely destroyed even to exposing the pulp, while

the approximating portion of the adjoining tooth remains intact? If decay is a problem of diet, why does it attack some of the teeth and not all of them and some of the surfaces oftener than others?

Respiratory Function.—The mouth, as an auxiliary of the respiratory system, plays an important rôle. This function of the mouth is often abnormally developed to compensate for nasal occlusion. The nose being primarily an organ of smell, only slight overexertion in bodily activities overtaxes its capacity and the individual breathes through the mouth. Certain nasal defects always accompany oral defects or vice versa. The relationship of malocclusion and nasal defects has been noted since the time of Morgagni and Trendelenburg, but there is little that the dentist can do toward improving the nose condition, once the mouth deformity has become well advanced and established. The nasal sinuses, particularly those of the maxillae, are closely related to the mouth. How much the well-being of the mouth contributes directly or indirectly to the condition of these and all the other sinuses of the head, we cannot say, but it is quite evident that the mouth should be kept clean and free from débris as a means of preventing respiratory diseases.

Function of Speech.—The mouth as an organ of speech gains still another contact with the respiratory tract. Here too, it behaves as an organ and not as a composite of dissociated parts. But the speech reflexes seem to be more important than the arrangement of the teeth. Often, persons with badly deformed mouths speak fluently and distinctly; while others with well formed mouths speak with difficulty. The mouth also contributes largely to facial expression, in which the teeth play a major part. For this reason, the teeth have been treated in a large measure from the standpoint of appearance, which is important to the personal and social welfare of every one. But the highest standard of looks can be obtained and retained only by having the chewing function of the mouth adequately cared for. Much has been said in the last few years about loss in facial dimensions and its effects on the appearance and personality of the individual. All the good that can possibly accrue in that way will be most fittingly supplied by concentration on the abberations of the mouth, particularly the chewing function, computing them carefully and by treatment reducing them to the smallest degree possible. When this is done, facial dimension, etc., will be taken care of.

Chewing Functions. — When the mouth is treated as an organ of digestion and made to function properly as such, all the other functions of the mouth will be most nearly correctly restored or maintained. The physiology of chewing is a complex process, but, like all complex processes, is made up of simple ones. When taken singly or in small groups, the factors that make up this complex process should not be too hard to comprehend. For the purpose of discussion, the following headings seem best: (*a*) motions of the mandible; (*b*) general arrangement of the teeth; (*c*) cusp and ridge relation of the teeth; (*d*) tongue, cheeks and lips.

The mandible, a single bone, capable of being moved in the three spacial directions, is operated on two hingelike joints, one on either side of the body. In this respect, it is unlike any other bone in the body. Each joint is theoretically the exact mate of the other, but in few mouths would this be found to be exactly true. The mandible is not swung like a cradle, but has definite fixed joints which control

its movements, and make its motions mechanically fixed. These motions can be measured and recorded. They form the basis of all operations to establish, reestablish or maintain the function of chewing. The motions are individual and generally differ in the two joints of the same jaw. They cannot be averaged either for full dentures or for mouths with natural teeth, particularly the latter. The claims of Gysi and others to the contrary only postpone the day of understanding.

The hinge axis of the mandible, which can be definitely located, is the axis of centric closure. The general arrangement of the teeth to afford closure is definitely related to this hinge axis. The normal overjet of the upper teeth is a condition which meets the requirements dictated by the lateral jaw motions. The slight protrusion of the upper incisors provides for prehension, which depends on jaw motion. Since the paths of the various sections of the jaw movements are arcs, it is only natural that the teeth are grouped into opposing arches whose individual curves correspond to the motions of the jaws sidewise, vertically, forward and back. The arrangement of the teeth in the arches suggests the motions made by the jaws. In the incisal region, where the greatest lateral motion is made, the teeth have the form of blades corresponding to the greatest arcs of motion. From the cuspid back to the third molar, there is a general diminution in the size of the buccal cusps, corresponding to the diminution of the arcs described by mandibular motion. The cusps and blades of teeth provide cutting ridges. Each ridge bears a definite relation to an opposing ridge, for the two, during mandibular motions, must meet like blades of a shear to cut the food held between them by the tongue and cheeks. The curve of Spee, a vertical modification of tooth arrangement, is related to mandibular motion, as has long been recognized. The shapes of the cusps, as well as the location, suggest an adaptation to the bilateral side motions of the jaw. The arrangement of the cusps in the crown of a multiple-cusp tooth is neatly adapted to the two lateral and the forward and backward motions of the jaw. The smaller ridges between the cusps are arranged also in a coordinate manner with the jaw motions and provide secondary cutting blades.

As far as mastication is concerned, the tongue, cheeks and lips propel the food about the mouth and hold it between the blades of the cusps. The teeth, of course, must be properly related to these structures for the best function, and they will be provided they are normally placed and their occlusal relations are correct.

The Mouth Not Wholly Reparative.—When the chewing function of the mouth is impaired or destroyed through the loss of tooth structure, there are no processes provided to bring about repair. Many other organs can repair themselves by regeneration of tissues or by increasing the function of tissues remaining, but the mouth only grows physiologically worse when it loses some of its chewing implements.

Biotic Factors of the Mouth.—Recovery following surgical operations or losses from natural causes depends on biotic reparative processes almost entirely. The biotic factors of the chewing function are not in the teeth themselves. The teeth are only the means of chewing; hence, they may be substituted for in whole or in part by restorations properly fabricated and administered. The remaining tissues of the teeth and the tissues of the mouth where teeth are lost admit of the administration of prosthetic remedies to an amazing degree. Should

the jaw become immobile or should it remain broken, and should a large portion be removed from either jaw, the biotic factors favoring prosthetic appliances are lost. Dentists owe these biotic portions of the mouth a debt of gratitude for accepting the remedies they insert. And, after all, not the teeth but the biotic factors remaining after the teeth become lost or functionless are the most important thing in the world to the dentist and patient. This characteristic is not entirely peculiar to the mouth. The crystalline lens of the eye does not do the seeing. It merely provides a means of seeing. If the biotic factors of the eye are left intact, or are sufficiently good, the sight may be restored with an appliance when the lens is destroyed or impaired.

RELATION BETWEEN THE MOUTH AND BODY DISEASE

Many, if not all, of the general metabolic disorders of the body are reflected in the chemical constituents and behavior of the fluids of the mouth. For this reason, a remote systemic disease may often be a determining factor in the diagnosis and treatment of the lesions of the teeth, bone and soft tissues of the mouth. Many slow acting and accumulative poisons affect the oral tissues, such as phosphorus, lead and mercury. There are probably inorganic poisons affecting the oral tissues specifically which the dentist cannot ignore, especially the periodontist. The physician who expects to treat his patients properly cannot ignore the mouth conditions because they are but a part of a vicious cycle that must be broken before the patient can recover his health.

Any lameness, insufficiency or infection of the mouth introduces a hazard to the general health that soon makes itself manifest. Volumes have been written in the last few years about the connection between bad health and bad teeth, but always, I believe, with the idea of promising or promoting a cure for some more or less obscure or mysterious systemic ailment. If the condition of the oral organ has resulted in a serious systemic involvement, a promise of a cure or benefit is folly on the part of the doctor, whether dentist or physician. The dentist can do little to restore health, but he can do much to preserve it, so great is the influence of a healthy mouth on the general welfare of the body. The best way to find health in any case is not to lose it. If the lesions of the mouth have produced secondary lesions in near or remote parts or organs, it is not good reasoning to expect the secondary lesions to disappear on cleaning up the mouth. A burning house may cast an ember and set fire to a distant house. Nobody would fight the second fire simply by putting out the first.

Functional disorders do undoubtedly pass away when oral lesions are eradicated before other organic lesions are established, but even if it could be proved that a dental abscess had produced appendicitis, I do not believe that anybody would expect to eliminate the inflammation of the appendix simply by extracting the tooth. It is true that the appendix might be removed and the tooth be left to cause other organic lesions, but the tooth abscess might be removed and the appendix be left to cause still other lesions. Oral health tends to bodily health, but once the mouth condition is allowed to cause general ill health, correction of the former will not reestablish bodily health. Proper treatment of the mouth is probably the greatest prophylactic service in the world today.

A person might have a very unclean and unhealthy mouth and be suffering

no general systemic disturbance, just as he might carry dynamite in his pocket without an explosion; but once the explosion has occurred, it is too late to avoid the consequences. Why should we tell a sick man that he should allow us to clean up his mouth and reestablish its function, and then fail to protect the man who is not sick, but who has the potential condition for an illness in his mouth? A clean, healthy mouth is its own excuse for being. We need no justification for a dental operation other than the fact that we have produced health and cleanliness in an important organ. Any systemic good that may result is simply the natural outcome of doing the proper thing. While we may, by reducing the load of infection and reestablishing the chewing function, help to stimulate the natural processes of recovery for a sick man, how much better it is to practice preventive dentistry in the true sense and take the dynamite out of the man's pocket, instead of trying to patch together the pieces after the explosion. No animal can live a normal active life without a healthy mouth, and man is no exception.

MOUTH TREATMENT

The problem of how to maintain, restore or contribute to the welfare of the mouth presents difficulties sufficient to tax the greatest intellects. If dentistry were taught from the standpoint of its real health problem, from the standpoint of the mouth, not from the aspect of the individual teeth, it would be as attractive as a cultural education, as any of the sciences. Treatment of any organ must follow a diagnosis which depends on a knowledge of the function of the organ. One of the important things any surgeon should know about an organ on which he operates is its function and the effect of loss or impairment of this function. The general surgeon, thinking in destructive terms, is concerned with the removal of part or all of an organ to get rid of pathologic tissues whose presence is a menace. There is little that can be done afterwards, except to stimulate and make the way as easy as possible for Nature to bring about repair. There is, however, a reaction coming to this destructive attitude. To make diseased tonsils well is a much greater credit to the surgeon than a tonsillectomy. Diseased gallbladders which are treated and made to function after infection is eliminated serve the patient much better than the most skilful cystectomy. There is surely no organ or tissue whose function can be wholly dispensed with, without some harm resulting.

The loss of the teeth entails the loss of the chewing function, which can be restored by cooperating properly with the biotic forces in the mouth. The dentist who works on teeth as though they acted independently and noncollectively, and as though they were only just things in the mouth arranged in a pair of arches and of importance principally for appearance, has failed to prevent infection, has failed to maintain the integrity of the mouth and has failed to make the teeth look their best, to say nothing of making them serve their main purpose—chewing.

The health of the mouth depends more on the state of the teeth than on any other condition. Without them or substitutes for them, it cannot perform its functions, and any malformation, malrelation or structural disease of the teeth results in a direct disturbance of bodily function. The study and understanding of the use and purpose of the teeth entails a mathematical, chemical and physical knowledge of the components of the mouth. The physiology of the mouth is exemplified and explained by exactly the same mechanical, chemical

and physical laws that explain the function of the heart, the eye or any other organ. The heart is a most effective system of chambers and valves that form a marvelous pump. The eye is a combination of lenses that form the basis of all cameras and optical instruments. The mouth is a milling machine that has no superior in any man-made device. The cardiograph and other instruments detect, record and measure the aberrations of the heart. All of us are more or less familiar with the instruments for measuring the defects of the eye.

The proper treatment for the heart, the eye, the mouth, or any other distinct organ goes hand in hand with the precision of the instruments or methods used to measure and record their aberrations. There can be no exception to that rule. Yet more than 70,000 people are engaged in the care of a single organ of the body, and they have not developed a system of measurements with precision instruments or methods that will enable them to detect, measure and record the aberrations of the mouth to a degree acceptable to a crude craftsman. So little do we know as a profession that we are constantly exploited and imposed on by manufacturers and persons with so-called ideas and methods to sell. A dental audience throws up its hands when the fundamentals of the physiology that directly concerns it is up for discussion, and says, both in words and effect, "That is over my head—too deep for me." And I once heard a president of the American Dental Association say that a dental meeting must not be too scientific—not over the heads of its members. If he meant to eliminate scientific bunk, well and good. But even that will take care of itself, if the profession will ground itself in the primary requisites for an understanding of the physiology of the mouth. Dentists will know these things when the schools teach them to men and women with a preliminary education, making them capable of comprehending.

It is all right to attack this problem with knowledge gleaned from the engineers, because mechanics and mathematics do form the basis of our investigation, but the application should be directly to the question and not to some preconceived theory. By direct tests only can information be elicited. All the engineering we need to resort to lies in devising means to apply these tests and in interpreting the results.

Since the hinge axis and the movements used in chewing are so important to the arrangement, shape, location and function of the teeth, it should be definitely located as the axis of centric closure. This is the most important measurement to be made, because it forms the basis of all other measurements. An error in location of this axis causes a greater discrepancy in our work than any other factor, because the influence of the hinge axis is seen in every movement of the jaw. Then, too, no articulating instrument has yet been invented that compensates, in the least degree, for any error in its location. The determination of the location of the hinge axis permits us to mount the upper cast in its proper relation to the hinge axis of the instrument used. By means of a centric bite, the lower cast may be mounted. The paths of the condyles can be determined by the lateral bites. After the condyles are set, the mounted study models, with the roentgenograms, furnish the chief data to study in preparing our diagnosis.

If surgery is indicated by the presence of infection, apically or gingivally, or by deformations not subject to nonsurgical reduction, it should be done in such a way as to leave the mouth clean and free

from infection, so that adjacent units will not be in any way menaced.

The prosthetic devices to be installed will naturally depend as to form and materials on the conditions present in the mouth. A decision as to whether they are to be fixed or removable will depend on the available anchorage and the stresses of mastication. Tooth preparation will depend entirely on just two things: (1) the amount of tooth structure destroyed and (2) the form of the restoration, to be dictated directly by the function of the mouth in the chewing motions. The final fabricated restoration should restore as completely as possible the function of the mouth. These restorations should embody the anatomic likeness of well-formed unworn teeth and should be in proper relation to the jaw motions. If they possess these qualities, they are apt to be cleanable and adaptive to the portion of the mouth that they are intended to restore, and they will look well.

It would be impossible in a short paper to give the technic involved in making the restorations thus suggested, which no doubt interests dentists more than anything else. The dentist's and the physician's problem is diagnosis, the end result of which should be what remedy, and why and when it should be applied.

I see no reason why dentists cannot record prescriptions for the remedies indicated by the diagnosis of the pathologic conditions of the mouth. But to do so entails a definite knowledge of the physiology of the mouth and an understanding of the real purpose instruments and methods can serve in analyzing and recording the conditions of each case that we are attempting to treat.

The problem of how to maintain, restore or contribute to the welfare of the mouth presents difficulties sufficient to tax the greatest intellects. If dentistry were taught from the standpoint of its real health problem, from the point of view of the mouth as an important part of the body and not from the aspect of the individual teeth, it would be as attractive as a cultural education as any of the sciences or liberal arts.

DISCUSSION

Harvey Stallard, San Diego, Calif.: Dr. McCollum condemns the following practices of overenthusiastic dentists: (1) attempts to cure patients of general ills by extracting pulpless teeth or by removing surgically parts of the investing tissues; (2) attempts at curing deafness, mental disorders or thyroid ailments by "bite-jumping or bite-raising." It is my own belief that such practices are doubly harmful because they misguide certain dentists who, in turn, misguide patients seeking health. However, Dr. McCollum does not advocate retaining infection in the mouth. He merely wants it understood that the surgery entailed in eliminating infection from the mouth is not dentistry. His attitude is a practical one for dentists, because he advocates treating the mouth for its own best health and function. Dentists are primarily orthopedic surgeons. Their job is the restoration and correction of dental tissues. Merely filling teeth or a vacant space does not constitute dentistry, but restoring the teeth to their full function and giving them the best possible form does constitute dentistry of the more practical type. The main contributions Dr. McCollum has made to dentistry are as follows: First, he has developed a method for determining the hinge axis of the mandible and has shown how important its location is to the opening, lateral and protrusive movements of the jaw. All the similar work done before on jaw motions and jaw-writings, particularly at the condyles, are untrustworthy because the investigators may have erred grossly in locating the true hinge axis, since they have relied on palpation. Campion of England may have located it by an opening and closing motion, but I have no available record that he did so. In the second place, Dr. McCollum has, by establishing the true mandibular hinge axis, made it possible to reproduce the necessary chewing motions fairly accurately in his gnathograph, which has permitted him to establish the main ridge

relations necessary for good chewing between opposing cusps, something never before done or attempted in cases under treatment. As the degree of accuracy in reproducing the movements of the jaw has progressed, he has been able to reproduce definitely many secondary ridge relations, so that he can more nearly restore the occlusal structures and the multiple incisive chewing function. Dr. McCollum's work will greatly modify our concepts and practice in orthodontia and restorative dentistry. The latter may now be specifically referred to as operative dentistry, crowns, bridgework and plate work. In orthodontia, the first thing Dr. McCollum will need to show us, which I suspect he can do easily, is that satisfactory centric occlusion established by orthodontists may not be functional, to say nothing of being normal. In restorative dentistry, restoration of a single crown, or of occlusal inlays differs little in principle from the employment of appliances containing more than a single unit. Let dentists again be reminded that their chief purpose is to maintain, restore and correct the occlusal surfaces of the teeth, the parts of the mouth most often neglected by dentists, because it is through these parts that the mouth performs its principal function for the body.

ANIMAL PARASITES OF THE MOUTH AND THEIR RELATION TO DENTAL DISEASE*

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OUR knowledge of animal parasites and their relation to human disease is much less complete than our knowledge of bacterial parasites. This is due, at least in part, to the fact that diseases caused by animal parasites often, though not always, progress to a chronic phase in which a balance between host and parasite is reached without either attaining complete ascendency over the over. Such diseases caused by animals are: malaria, chronic amebiasis, filariasis, intestinal flagellosis, many animal trypanosome infections, etc. On the other hand, bacterial infections are more likely to run an acute course, with more rapidly developing and clear-cut symptoms, and speedy victory for either host or parasite. This results in the complete syndrome coming under the observation of the physician, with consequent completeness of knowledge.

Animal parasites of the mouth have been but little studied by protozoologists until very recently, in spite of the fact that a considerable percentage of the adult population is infected with one or both of the common one-cell animals which occur in close association with certain forms of gingival disease. It is the purpose of this paper to review the recent clinical and biologic work on the animal parasites of the human mouth.

The possible significance of these forms and their wide distribution and consequent availability, together with their occurrence in a site where pathologic processes can be observed continuously and can be measured, recommends

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these organisms to the observer and experimenter in biology as well as to the student of disease. Parasites dwelling in the intestine and in the blood are at all times more or less inaccessible to the observer and are not available to the work of the experimenter. Their sites of multiplication, their differential distribution, the inflammatory responses of the host, if any, can be readily observed only at necropsy. Their presence can be determined and their structure studied only from forms found in the peripheral blood or in the feces, or from specimens grown *in vitro* and hence not pathologically active at the time of observation. Their numbers are often so diluted by blood or fecal material as to limit considerably the range of observations in a given time.

The two common parasites of the mouth, *Endameba gingivalis* and *Trichomonas buccalis,* will be dealt with in separate sections.

ENDAMEBA GINGIVALIS (GROS)

History.—Gros[1] first directed attention to the common ameba of the human mouth by giving it a meager description and the name *Amoeba gingivalis.* It is of interest to note that this was the first parasitic ameba of man to be discovered. Although the specific name *buccalis* has enjoyed wide usage, there is no doubt that Gros saw and drew with considerable accuracy the common ameba of the mouth. His drawings show the characteristic large, broad hyaline pseudopodia and the enclosed food vacuoles. His description is much less instructive than his drawings, and he suggests a comparison of the enclosed food vacuoles with those observed by Ehrenberg in the infusoria to which the name *Polygastrica* was given by the latter investigator. Gros has thus correctly interpreted these as food vacuoles. The source and fate of these organisms interested him, and he asked the question, *"Est-ce encore une generation spontanee?"*

Thirteen years later, Steinberg,[2] ignorant of the work of Gros, dealt with the same organism at length in a thesis published in Russian. His work is of little value, and it cannot be definitely ascertained whether he was working with the common mouth ameba because of his inadequate description and his failure to publish drawings.

Grassi, in 1879,[3] reported, in one brief paragraph without illustrations, the existence of an organism from the human mouth which he called *Amoeba dentalis.* He mentioned that it was found in gingival inflammation and that it resembled the *"Amoeba coli"* of the human intestine. He later[4] doubted his own observation and suggested that he had seen only salivary leukocytes.

In 1904, Prowazek,[5] apparently ignorant of the work of the preceding observers, published an account of what he thought to be a new ameba. It is not surprising that he gave the specific name previously employed by Steinberg, since the name *Entameba buccalis* is a logical one to apply to an organism in this habi-

1. Gros, C.: Fragments d'Helminthologie et de Physiologie microscopique, Bull. Soc. Imp. de Nat. de Moscou, 22:549-573, 1849.

2. Steinberg, S.: Investigation of the Soft White Matter Which Accumulates on the Teeth and Between Them. Sovremennaya Med., Kiev, 20, 24:377, 452, 1862.

3. Grassi, B.: Dei Protozoi parassitti e specialmente de quelli che sono nell uomo, Gazz. med. ital., Lombardy, 39:445-448, 1879.

4. Grassi, B., in Railliet: Traité de Zool. méd. et agricole; éd. 2, pp. 737-1303 (figs. 495-892), 1895.

5. Prowazek, S. von: Entamoeba buccalis n. sp. vorläufige Mitteilungen Arb. a. d. k. Gesundhtsamte, 21:42-44, 1904.

tat. Because of the wide circulation which this article received and because of Prowazek's standing in the field of protozoology, his name was the accepted one previous to 1915.

Brumpt, in 1913,[6] called attention to the priority of the specific name given by Gros and referred the parasite to the genus *Endameba* Leidy.

In July, 1914, Barrett[7] made the significant announcement that he found *Endameba gingivalis* in nearly all cases of pyorrhea alveolaris which he examined. He advanced the hypothesis that it was of etiologic significance in this disease since emetin hydrochlorid and other derivatives of ipecac seemed to be of therapeutic value.

In August of the same year, Chiavaro,[8] a student of Grassi, published a valuable contribution containing clinical data on sixty-eight examinations for the presence of *Endameba gingivalis*. In 100 per cent of twenty-two cases of classic pyorrhea, with the production of macroscopic pus, the parasite was found without exception. One of these cases, after treatment with "medicine containing inorganic acids," did not yield amebas in the single examination following treatment. In twenty cases of caries, the amebae were present in the cavities of five individuals and absent in fifteen. We cannot be certain from his account that incipient pyorrhea might not have been present at the same time in the gums. In *materia alba* removed from the necks of teeth in thirteen examinations, seven specimens contained amebae and six contained none. In seven samples of hard, triturated tartar washed in running water, there were no amebae. In two specimens of "yellow-orange deposit," amebae were found. They were present in the pus from one case of alveolar sequestrum and absent from the following: one specimen of "greenish deposit," one specimen of pus from a cutaneous fistula and one gangrenous pulp. Chiavaro's conclusions based upon the preceding observations were that the ameba, instead of being pathogenic, might be of value as a disinfecting agent, ingesting bacteria and cellular débris.

In the following month (September), Bass and Johns[9] reported the presence of *Endameba gingivalis* in eighty-six cases of pyorrhea and their absence in many normal individuals. Beneficial results following the administration of emetin hydrochlorid led them to assign a pathogenic rôle to this organism. In the following year, they extended and confirmed these observations in 300 cases.[10] In the same year,[11] their observations and arguments were presented in the form of a book which contained the gist of the affirmative evidence for their theories. In this work, they continually assume that the parasites are living in and at the expense of the gingival and alveolar tissues, without, however, showing histologic evidence of such localization. They state that amebae were found to be most numerous at the extreme depth of the pocket. This is based upon evidence secured in

6. Brumpt, E.: Précis de Parasitologie; éd. 2, Paris; Masson et Cie, 1913.

7. Barrett, M. T.: Protozoa of the Mouth in Relation to Pyorrhea Alveolaris, Dent. Cosmos, 56:948-953, 1914.

8. Chiavaro, A.: Researches upon Entamoeba Buccalis, Dent. Rev., 28:1122-1135, 1914.

9. Bass, C. C., and Johns, F. M.: Unpublished report to the Orleans Parish Medical Society, September, 1914.

10. Bass, C. C.: Pyorrhea Dentalis and Alveolaris. Specific Cause and Treatment, J. A. M. A., 64:553-558, 1915.

11. Bass, C. C.: Alveolodental Pyorrhea, Philadelphia: W. B. Saunders Company, 1915.

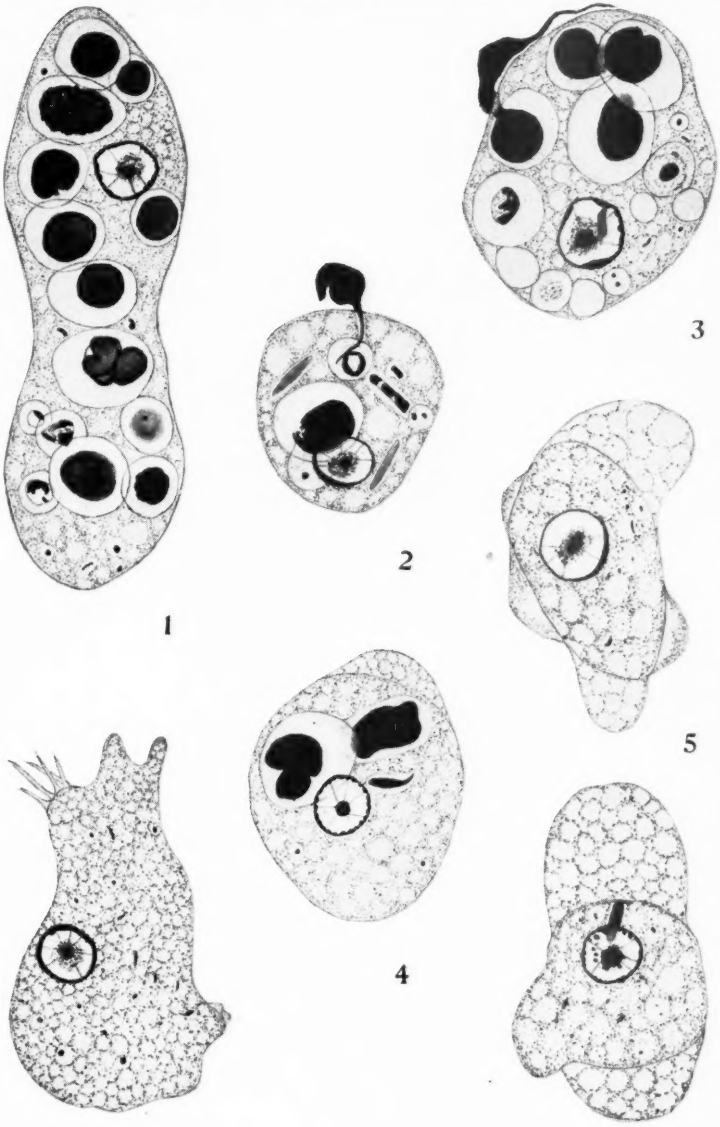

Fig. 1.—Camera lucida drawings of amebae (*1-5, 7*) and Endameba gingivalis (*6*) from preparations fixed in Schaudinn's fluid and stained with iron-hematoxylin; reduced from a magnification of 3,600 diameters. (Drawn by Herbert G. Johnstone.) See page 1440 for detailed description of organisms.

the following way and in a single recorded case. Smears were made from various points on the surface of an extracted tooth from a case of pyorrhea. Amebae were recovered in much the greatest numbers in a smear prepared from material removed from the surface of a ledge of subgingival tartar at a point nearest the extreme depth of the pocket. This observation has received little attention by subsequent workers, but has been strikingly confirmed and extended in observations later to be described.

The use of ipecac derivatives in the treatment of pyorrhea became an almost universal practice among progressive dentists after the appearance of the important publications of Smith and Barrett and of Bass and Johns. The results furnish one of the most disappointing chapters in medical and dental history. It was not long before it became evident that emetin was not a specific for pyorrhea. This lead to the abandonment of the procedure and also of the theory upon which the practice was based (Dobell and Laidlaw[12] and Howitt[13]). The term "pyorrhea" had no sharply limited clinical definition, in consequence of which many reports were published on the presence of *Endameba gingivalis* in mouths that were considered by the observers to be free from pyorrhea, (Williams et al.[14] and Mitchell, Culpepper and Ayer[15]). Others reported their absence from cases considered to be pyorrhea. Thus, in a relatively short time, the theory was abandoned. Its fall was as rapid as its rise and fully as dramatic. It has been accepted on insecure and insufficient evidence, but was rejected because of even weaker logic.

E. GINGIVALIS FROM MAN AND THE MONKEY (FIG. 1)

The camera lucida drawings (Fig. 1) show: *1.* An ameba from an advanced case of human pyorrhea. The types of ingesta within the vacuoles and the leukocytes and "salivary corpuscles" in various stages of digestion are of interest. The nucleus is irregular with a heavy peripheral band of beaded chromatin. *2.* An ameba from a direct smear of gingival exudate from a case of human pyorrhea. There are large bacilli and mycelial strands in the endoplasm. Siderophilous material is being egested. The nucleus is elliptical. *3.* An ameba from the case referred to in *1.* There is siderophilous extrusion. A large, irregular karyosomal granule, a blobbed peripheral chromatin and an irregular granular halo may be noted. *4.* An ameba from a case of human pyorrhea. There is a partly digested "salivary corpuscle" in one of the vacuoles. *5.* An ameba from a culture from monkey 8. There are five pseudopodia, with an absence of large vacuoles, nonbeaded peripheral chromatin and a large granular karyosome. *6.* Endameba gingivalis from culture material of monkey 8. Small pseudopodia and finger-like spicules are present. The peripheral chromatin is thick and smooth. There are many bacteria within the en-

12. Dobell, C., and Laidlaw, P. P.: Action of Ipecacuanha Alkaloids on Entamoeba Histolytica and Some Other Entozoic Amoebae in Culture, Parasitology, 18, 206-223, 1926.

13. Howitt, Beatrice F.: Effect of Certain Drugs and Dyes upon the Growth of Endamoeba Gingivalis (Gros) in Vitro, Univ. Calif. Publ. Zool., 28, 173-182, 1926.

14. Williams, A. W.; von Sholly, A.; Rosenberg, C., and Mann, A. G.: Significance and Prevention of Amebic Infections in the Mouths of Children. Collected Studies from the Bureau Laboratory, City of New York, 8:405-408, 1914-1915.

15. Mitchell, O. W. H.; Culpepper, W. L., and Ayer, W. D.: Endamoeba Buccalis in the Mouths of Institutional Children, J. M. Res., 35 (N. S., 30):51-53, 1916.

doplasm. 7. An ameba from culture material of monkey 8. The karyosome is granular. One large bacillus lies just below the nucleus.

Morphology.—Several more or less brief morphologic studies on *Endameba gingivalis* appeared early. These deal chiefly with the appearance of the animal in the living state and the nature of the food inclusions. It was not until 1924 that a critical study of nuclear structure appeared. This investigation (Kofoid and Swezy[16]) was prompted by the rather widespread opinion that arthritic symptoms are correlated with focal infections of the mouth. Having reported the finding of *Endameba dysenteriae* (*E. histolytica*) in the bone marrow in cases of arthritis deformans, it occurred to these authors that the mouth was a conceivable source of amebic parasites. A detailed study of the cytologic structure, particularly the nucleus, of *E. gingivalis* and of *E. dysenteriae* served effectively to separate these two species. In an absence of knowledge regarding the physiology of these organisms, nuclear structure is our most dependable criterion for differentiation of species.

In size, most specimens of *Endameba gingivalis* range from 12 to 25 μ in diameter, although specimens as small as 6 μ and as large as 60 μ have been described. In the living state, the protoplasm is of a greenish, waxy, refractile appearance, which distinguishes it from débris in which it may be partially or wholly imbedded. When in the rounded state, the ectoplasm is not differentiated from the endoplasm. When in active locomotion, the distinction between these layers is clear, the ectoplasm being remarkably hyaline and with a high refractive index. An external pellicle is readily visible. Pseudopodia are usually few in number, broadly blunt, large and quite hyaline and are frequently thrust out with explosive rapidity resembling large blisters in appearance. When cold or moribund, the pseudopodia may be formed very slowly, several minutes being consumed in the protusion of a single pseudopodium. When lacking proper substratum, as in a hanging drop, a number of small conical pseudopodia may be formed and retracted, if no favorable substratum is encountered. The endoplasm is very finely granular in life, and, when observed with dark-field illumination, is seen to contain a number of refractile granules not readily seen by transmitted light. The leukocytic food vacuoles are often seen in life. The nucleus is seldom visible.

Fixed specimens of *Endameba gingivalis* stained with Heidenhain's iron hematoxylin present a distinct and uniform pellicle. The ectoplasm is lightly stained and finely granular or faintly alveolar. The endoplasm contains more siderophilous material and is not so distinctly differentiated from ectoplasm as in life. The leukocytic food vacuoles stain intensely in many instances, although not infrequently vacuoles in a late stage of digestion stain less intensely. The liquid siderophilous contents of these vacuoles may be extruded in long strands. This is not an artefact traceable to the smearing process, but a normal step in the metabolism of the nucleoprotein as is evidenced by the fact that other amebae may ingest these strands, or strands from two amebae may tend to fuse. It is our opinion that the quantity of nucleoprotein which can be metabolized by an

16. Kofoid, C. A., and Swezy, O.: Cytology of Endamoeba Gingivalis (Gros) Brumpt with Special Reference to the Determination of the Amoebae in Bone Marrow in Arthritis Deformans of Ely's Second Type, Univ. Calif. Publ. Zool., 26:165-198, 1924.

ameba is strictly limited. The remainder is probably not split farther than into protein and nucleotids. The former is assimilated and the latter is ejected. The amount of protein obtained in this manner from a given mass of nucleoprotein is relatively small, and this accounts for the voracious appetite of what is a relatively sluggish animal in its normal habitat. From the shape of these strands, it appears that they are spit out with explosive rapidity and rapidly eliminated. This accounts for the relative infrequence with which the process is observed. It must be admitted that this process takes more time than the ingestion of food particles, for the latter has seldom been observed, and stages of this process are much scarcer in stained preparations than those of regurgitation of nucleotids.

Child[17] also made a valuable contribution to the life history of this parasite in describing its reproduction by a complicated and orderly process of true mitosis.

Feeding Habits.—Nowlin[18] presented a purely hypothetical life cycle to account for periodic disappearance of the parasites, assuming that they retreated into the tissues at such times. No fact has ever been brought to light which supports this idea. The same author[19] presented another brief and inconclusive account of the food taking habits of the organism and of its behavior. Failing to observe stages in the actual ingestion of solid food particles, she assumed that the process did not occur and that the organism fed chiefly by osmosis.

Goodey and Wellings[20] attacked this problem of the food habits of *Endameba gingivalis.* Their conclusion differed from that voiced by von Prowazek,[5] who assumed that the ameba lived largely on leukocytes. Goodey and Wellings concluded that not living leukocytes but the denuded nuclei of degenerated leukocytes constituted the main source of food, together with various bacteria. They thus concluded that the ameba could be considered as beneficial in destroying cellular débris and bacteria which might be harmful.

Although this conception has been widely accepted, the work of Child[17] has now demonstrated all stages in the ingestion of normal living leukocytes by the amebae. The cytoplasm was observed to be stripped off and the nuclei of the leukocytes liquefied for food. The undigested remains were frequently extruded, a process previously observed by Kofoid and Swezy.[16] It should be stressed that the relative infrequence with which ingestion of leukocytes is observed may not mean that it is unusual, but that it takes place with relative rapidity. The parasites are seldom seen in the process of food ingestion, but are seen to eat leukocytes as frequently as any other food, and in full activity *in situ* are habitually gorged with leukocytes, rather than with bacteria or red cells.

In vivo, it is evident, from the work

17. Child, H. J.: Studies on the Ingestion of Leucocytes, and on Mitosis, in Endamoeba Gingivalis, Univ. Calif. Publ. Zool., 28:251-284, 1926.

18. Nowlin, N.: Endamoeba Buccalis. 1. Its Multiplication and Periodicity, J. Parasitology, 3:143-149, 1917.

19. Nowlin, N.: Endamoeba Buccalis. II. Its Reactions and Food Taking, J. Parasitol., 4:21-24, 1917.

20. Goodey, T., and Wellings, A. W.: Observations on Entamoeba Gingivalis from the Human Mouth, with a Note on the Trichomonad Flagellate Tetratrichomonas Buccalis, N. Sp., Parasitology, 9:537-559, 1927.

of Kofoid and Hinshaw,[21] that the life of the ameba is quite intimately bound up with that of the filamentous bacteria of calculus.

Physiology and Cultivation.—A very significant contribution to the study of the ameba of the mouth was that offered by Howitt,[22] who was the first to cultivate this parasite successfully *in vitro,* although Drbohlav[24] published his findings first. Of particular significance is her observation that, when living *in vitro,* the organism ingests red blood cells, preferably human erythrocytes. Furthermore, the organism possesses the ability to hemolyze these cells even when not ingested. This suggests a relationship to *Endameba dysenteriae,* which it so closely resembles morphologically. Howitt[23] also observed the ingestion of living leukocytes in her cultures, verifying the observation of Child,[17] who saw the same phenomenon *in vivo.*

Drbohlav (1925)[24] independently accomplished the cultivation of *Endameba gingivalis,* using a technic very similar to that employed by Howitt.

The ameba is positively chemotactic for leukocytes and erythrocytes, ingesting both in cultures and possibly *in vivo.* The formation of giant cells about the ameba (Child[17]) indicates clearly the production of chemotactic substances, according to Wells.[25] This makes it possible that the ameba is pyogenic. The relative pyogenic activities of these protozoa and the pyogenic bacteria found in the actively suppurating pyorrhea pockets cannot be well ascertained. We have determined that the ameba is never present in the absence of a leukocytic exudate (Hinshaw and Simonton[26]), while many bacteria are found about gums that are not inflamed. It is entirely possible that the extruded nucleotids constitute at least a portion of the chemotactic substances. Nucleinic acid is positively chemotactic (Wells[25]). *In vitro,* human red blood cells are attracted to *Endameba gingivalis.* Howitt[22] observed from twenty to thirty red blood cells attached to a single ameba. Of 274 amebae counted, seventy were found to contain from one to six erythrocytes within the endoplasm. She also observed the extracellular hemolysis of human red blood cells lying close to amebae. All this suggests powerful intracellular and extracellular enzymes capable of attacking human cells and tissues.

Howitt[22] showed that *E. gingivalis,* in mixed bacterial cultures, is able to withstand a wide range of hydrogen ion concentration, the initial p_H for optimal growth lying between p_H 7.0 and 7.8. The growth curve of the amebae in mixed bacterial culture follows that of the bacterial curve. Howitt also found that *E. gingivalis* is able to exist and multiply in the presence of cod-liver oil,

21. Kofoid, C. A., and Hinshaw, H. C.: Distribution in Situ of Endamoeba Gingivalis and Its Relation to the Filamentous Bacteria in Calculus, J. Dent. Res., to be published.

22. Howitt, Beatrice F.: Culture of Endamoeba Gingivalis (Gros), Univ. Calif. Publ. Zool., 28:65-126, 1925.

23. Howitt, Beatrice F.: Experiments with Endamoeba Gingivalis (Gros) in Mixed Bacterial Cultures; in Filtered Saliva; on a Solid Base; with Peritoneal Cells; and with Digestive Secretions, Univ. Calif. Publ. Zool., 28:183-202, 1926.

24. Drbohlav, J. J.: Culture d'Entamoeba Gingivalis (Gros, 1849) Brumpt, 1913, Ann. Parasitol., 3:361-363, 1925.

25. Wells, H. G.: Chemical Pathology, Philadelphia: W. B. Saunders Company, 1925.

26. Hinshaw, H. C., and Simonton, F. V.: Amoebas of the Mouth in Relation to Incidence of Pyorrhea, Clinical Symptoms, Extent of Lesions and Age of Patients, J. Dent. Res., to be published.

of glucose in small concentrations and of certain proteins, peptones and amino-acids. Howitt[13] demonstrated the effect of certain drugs and dyes on *E. gingivalis*. She found that stovarsol is the most effective of the substances used *in vitro* against cultures of *E. gingivalis,* and yatren, the least effective; that arsenical compounds are more toxic than the non-arsenical; that emetin hydrochlorid, although somewhat toxic for the amebae, is not specifically effective *in vitro,* and that of the dyes acriflavin and gentian violet, the former can be used only in high dilutions because of its toxicity, while the latter can be used in much stronger concentrations, but without greatly hindering the amebic growth. Howitt,[23] in a later paper, showed that *E. gingivalis* will thrive in the presence of filtered human saliva, provided a solid substratum of coagulated egg is present. The amebae were unable to withstand contact with human gastric juice containing the normal amount of acid, but would survive for several hours in fluid lacking in or with a reduced content of free hydrochloric acid. The organisms rapidly explode in the presence of human bile, but merely shrink up and gradually degenerate when in contact with concentrated bile from the cat or the guinea-pig.

Koch,[27] working with such dyes as acid fuchsin, phenosafranin, brilliant green, basic fuchsin, ethyl violet, acridin orange and acriflavin, either singly or in mixtures, was able to demonstrate the selective action of some of these dyes and dye mixtures. In many cases, a bacterostatic effect was obtained without toxicity to the protein of the ameboid cell. This action resulted in the prolongation of the life of the culture, and thus, without transplanting or changing the medium in any way, *E. gingivalis* remained alive and motile for twelve days. Koch is of the opinion that *E. gingivalis* can live in culture with bacteria in very small numbers. Reproduction of bacteria is not necessary for the growth of *E. gingivalis,* and it is considered not impossible that bacteria are unnecessary for growth, if other food materials is supplied. Koch suggests tricresol 1:100 and formaldehyd 1:20 as effective disinfectants for killing cultures and general sterilization. The dyes which were amebicidal in high dilution were not injurious to the gum tissue of normal rabbits and may probably be used as oral antiseptics. Koch[28] obtained interesting results from experiments dealing with the relation of moisture and temperature to the viability of *E. gingivalis in vitro.* It was found that the ameba is, apparently, remarkably resistant to temperatures lower than the optimal. *E. gingivalis* will remain alive after being exposed to a temperature of 0 C. for 18 hours. The ameba will survive temperatures of from 20 to 40 C., that is, from room temperature to a little above body temperature, indefinitely, but is rapidly killed at 55 C. and will not withstand temperatures between this and 45 C. for any great length of time. Through experiments on the effect of drying culture material containing motile *E. gingivalis,* it was found that the organism is unable to withstand a total absence of moisture. If the great resistance to low temperatures and the great resistance to drying are considered

27. Koch, D. A.: Experimental Study of the Effects of Dyes, of Dye Mixtures, and of Disinfectants upon Endamoeba Gingivalis (Gros) in Vitro, Univ. Calif. Publ. Zool., 29:241-266, 1926.

28. Koch, D. A.: Relation of Moisture and Temperature to the Viability of Endamoeba Gingivalis (Gros) in Vitro, Univ. Calif. Publ. Zool., 31:17-29. 1927.

together, it may be concluded that *E. gingivalis* is easily transmitted by "droplet infection" and that any minute amount of saliva carrying the organisms, even though it be microscopic, may be infectious, if not completely dry. It is possible, then, to spread the organisms by the use of the common drinking cup, spoon and like utensils, as well as by direct contact.

Howitt's[22] modification of the Locke-egg-slant-albumen medium of Boeck and Drbohlav[29] was used as the routine medium for the cultivation of *E. gingivalis*. Coagulated egg slants containing a small amount of Locke's solution were used as a solid base, and to these slants was added the Locke's albumen solution.

Gingival exudate was removed from the mouths in pyorrhea cases with a straight shafted dental scaler and introduced into tubes of Locke's egg albumen previously heated to 37.5 C. All cultures were incubated for forty-eight hours at body temperature and subsequently examined for the presence of amebae.

Several strains of *E. gingivalis* have been cultivated in this laboratory for extended periods, one strain being maintained under artificial cultivation for thirty-three months. Each culture is transplanted every forty-eight hours and kept at body temperature. There is no reason to doubt that culture of the amebae can be prolonged indefinitely if proper care is maintained.

Recently, one of us (H. G. J.) has shown that *E. gingivalis* is capable of ingesting starch grains. A small amount of starch added to a culture of *E. gingivalis* in Locke's egg albumen prolongs the life of the culture as long as ten days; causes an increase in size of nearly 50 per cent, greatly increases the number of amebae and causes a peculiar disarrangement and great increase in quantity of the nuclear chromatin and a production of trinucleate amebae.

Relation of Endameba Gingivalis to Clinical Conditions.—The work of Chiavaro,[8] referred to above, is the first tabulated account of the conditions in which the ameba of the mouth is found. Unfortunately, he was more interested in the pathology of the tooth itself than in that of the gingivae. Most observers have since made reference to the ameba in relation to the presence or absence of pyorrhea (Bass and Johns,[11] Smith and Bassett[30]).

Since a universally accepted definition of pyorrhea is lacking, Hinshaw and Simonton[26] attempted to correlate amebic infection with objective symptoms expressed in a quantitative way in 357 cases. Their figures are primarily based upon data obtained from very young individuals (students), and hence could not be expected to be duplicated on similar fractions of the general population. There are very distinct advantages in the use of a fairly uniform group, especially if they are young.

Their conclusions included a statement that amebae were never found in the strictly normal mouth and were invariably found in typical inflammatory pyorrhea from its incipiency until its termination, thus substantiating the early claim of Bass and Johns and of Smith and Barrett. The existence and extension of gingival pockets is an invariable

29. Boeck, W. C., and Drbohlav, J. J.: Cultivation of a Pathogenic Amoeba (Endamoeba Histolytica) from a Case of Relapsed Dysentery. (Read before the American Society of Tropical Medicine, Chicago, June 9, 1924.)

30. Smith, A. J., and Barrett, M. T.: Parasite of Oral Endamebiasis, Endamoeba Gingivalis (Gros), J. Parasitol., 1:159-175, 1915.

accompaniment of the inflammatory type. The amebae were always found in the well-kept mouths of these young persons when pockets were found with a depth of 2 mm. or more. Commonly, but not invariably, the gum margin had receded. Microscopic pus could always be demonstrated even when there was no gross pus at all and relatively little reddening of the gums. A purplish venous stasis characterizes more advanced cases. The gingivae are not always hypertrophied. Little significance could be associated with the presence or absence of calculus because most of the patients had it removed at frequent intervals.

Large amounts of detritus seemed to be inhibitory to the growth of amebae in the mouth. This, together with experiments in the culture tube, demonstrates that the amebae will not tolerate association with the putrefactive bacteria of decaying débris and must not be thought of as scavengers or organisms of decay.

No correlation was noted with the presence of caries or a history of caries. The saliva was usually plentiful or of a physical constitution which caused the production of a glairy film over the mucous membrane of the mouth. Patients who took good care of their mouths were just as likely to bear the infection. Syphilitics who had received treatment with neo-arsphenamin and mercury did not show any evidence that the parasites are killed *in vivo* by these treatments.

With increasing age, the incidence of infection rapidly increases until those over 40 years of age have an incidence of 75 per cent or more. Nearly 50 per cent of all persons studied showed the infection, in spite of the preponderance of young patients.

Localization in the Pyorrhea Pocket.—It is surprising that *Endameba gingivalis* was not reported from histologic sections of dental material at an earlier date (Kofoid and Hinshaw[21]). This is undoubtedly due to the technical difficulties in the way of making sections of tissue with tooth, bone, calculus and soft tissue *in situ,* in proper relations. It remained for Kofoid and Hinshaw[21] to first describe the location and associations of the parasite *in situ* in the pyorrhea pocket. In confirmation of the work of Naeslund,[31] the subgingival calculus was found to consist of the calcified strands of filamentous bacteria of the leptothrix and actinomyces groups. Naeslund offers convincing evidence that these organisms are the etiologic factor in the formation of this deposit. Kofoid and Hinshaw find hundreds of amebae (*E. gingivalis*) clustered among the terminal strands of these vegetations and forming a veritable palisadal covering to the calculus where the latter impinges on the tissue of the gum.

The amebae extend to the extreme depth of the pyorrhea pocket, and are most numerous in the deeper levels about the area of most extensive deposit of the calculus. This substantiates the commonly repudiated claim of Bass and Johns[11] that the parasites are most numerous in the depth of the pyorrhea pocket.

Experimental Infection of Animals with Endameba Gingivalis of the Human Mouth.—The experimental infection work done in this laboratory has been with dogs and monkeys, the latter represented by the two species *Macacus rhesus* and *Macacus cynomolgus.*

Previous to the inoculation of each dog, a thorough examination of the mouth was made. In selecting favorable

31. Naeslund, C.: Studies of Actinomyces from the Oral Cavity, Acta. path. microbiol. Scandinav., 2:110-140, 1925.

dogs at the pound we took only those that were in good physical condition and showed a good or fair oral condition. In the first group of dogs selected, reddening of the gums, gingivitis and ginival pockets were evident. Each dog was submitted to a detailed examination, the general tone of the whole mouth and the condition of each tooth with its adjacent tissues being noted. Natural color photographs and roentgenograms of several of the dogs were taken.

Prior to inoculation, the dogs were examined for possible protozoan contaminations. Cultures in Locke's egg albumen and gingival exudate smears stained by the ordinary iron-hematoxylin method were made. A straight shafted dental scaler proved to be the best instrument for removing the material. All cultures were incubated for 48 hours at 37.5 C.

In order to avoid any possibility of overlooking a focus of infection, the whole mouth was examined. Those dogs that were infected with *Trichomonas buccalis* were sent back to the pound, as well as those that had a type of spirochetal infection resembling Vincent's.

To prevent chilling, the cultures of *E. gingivalis* used for inoculation, obtained at San Quentin and San Francisco, were transported from these places in pockets sewed on the inside of the vest. The tubes were incubated for 48 hours at 37.5 C., and then examined for the presence of amebae. We are of the opinion that it is better to use fresh cultures for each inoculation in preference to cultures that have been maintained *in vitro* for long periods. The dogs were anesthetized before inoculation. A syringe was found unsatisfactory for inoculation of the material from the cultures because the small particles of egg that are always present clog the needle. A Pasteur pipet was used to transfer the amebae from the bottom of the tube to the teeth, and as the material was dropped on the tooth, the small particles of egg and débris (to which the amebae cling) were forced under the gingiva with a curved dental instrument. The upper teeth only were inoculated, the lower being used as controls. Subsequent cultures and smears taken showed whether or not the inoculation had been successful. It was found better not to remove any gingival exudate for one or two months after inoculation, to avoid the possibility of destroying a focus of infection. The one monkey inoculated could be handled without being anesthetized.

Direct smears of gingival exudate from the human, dog and monkey mouths and smears from culture material, were made by moistening the material in sheep serum and spreading it thinly on glass slides. The wet preparation was fixed in hot Schaudinn's fluid and stain by the usual iron-hematoxylin method.

Nile blue sulphate (Grübler) affords an excellent opportunity for the observation of motile amebae from cultures. If the amebae are grown in a dilution of 1:40,000 in Locke's egg albumen, many striking characteristics can be noted. The inclusions within the ameba are stained a distinct blue so that the endoplasm and ectoplasm are clearly defined and pseudopodial movement is easily observed. A simpler method is to add a drop of Nile blue, made up in Locke's solution in a dilution of 1:50,000, to a slide preparation of the culture material. This gives a more intense stain than is obtained by the above mentioned method. The nucleus is clearly seen and the details of movement can be followed with ease.

With the exception of the one dog infected by Hinshaw[32] with *Endameba gingivalis* of the human mouth, this parasite has not been successfully maintained heretofore in experimental animals. We have infected five dogs with this ameba, and examinations up to the present time confirm their presence. As already stated, each dog is submitted to a thorough examination, covering extended periods, to demonstrate the absence of a possible spontaneous infection of oral amebae. Of all the dogs examined, none showed any spontaneous infection of oral amebae. All of the dogs infected and the controls are kept on properly balanced diets and under the best living conditions. A total of eleven dogs were inoculated with culture material containing *E. gingivalis*; and in five of them, the parasite continues to multiply. It was found that the infection was successful only in those dogs which showed gingival inflammation, pocket formation or loose gingivae at the time of inoculation. The dogs with mouths in excellent condition did not become infected.

It was our intention, when the work first began, to try inoculating dogs and monkeys with *E. gingivalis* from the human mouth; but with the subsequent examinations of the monkeys' mouths, it was found that all of our monkeys were parasitized with a species of ameba identical with the human form of *E. gingivalis*. The monkeys used in our experiments were *Macacus rhesus* and *Macacus cynomolgus*. Cultures and smears were made of the gingival exudate for purposes of routine examinations and study. The results of these examinations showed that all of the monkeys were parasitized with this ameba, some more heavily than others. The condition of those monkeys showing the heaviest infections closely resembled pyorrhea of man.

Monkey 12 was inoculated with *E. gingivalis* of man, with the possible hope of a differentiation being established between the two forms, but on examination of the slides, all of the amebae were found to be morphologically identical, and it was impossible to determine whether or not the human form had become infective.

Doubtful Species.—It has been claimed by many that there is more than one species of ameba found in the oral and pharyngeal regions of man, but the majority of workers today believe that *E. gingivalis* is the only amebic parasite in these regions. The forms described as *Entamoeba maxillaris* Kartulis,[33] *Entamoeba kartulisi* Doflein,[34] *Amoeba pulmonalis* Artault,[35] *Entamoeba pulmonalis* Brumpt,[36] *E. pyogenes* Verdun and Bruyant,[37] *E. confusa* Craig[38] and *E.*

32. Hinshaw, H. C.: Experimental Infection of Dogs with Endamoeba Gingivalis and Trichomonas Buccalis of Human Mouth, Proc. Soc. Exper. Biol. & Med., 25:430-431, 1926.

33. Kartulis, S.: Ueber pathogene Protozoen bei dem Menschen. I. Gregarinose der Leber und bei Bauch muskeln. II. Amoeben bei Knochennekrose (Osteomyelitis) des Unterkiefers, Ztschr. f. Hyg. u. Infekt., 13:1-14, 1893.

34. Doflein, F.: Lehrbuch der Protozoenkunde (ed. 3), Jena: Gustav Fischer, 1911.

35. Artault, S.: Flore et faune des cavernes pulmonaires, Arch. de Parasitol., 1:217-307, 1898.

36. Brumpt. E: Précis de Parasitologie éd. 2, Paris: Masson et Cie, 1913.

37. Verdun, P., and Bruyant, L.: Sur la présence d'amibes dans le pus d'abces de la région malaire, Compt. rend. Soc. de biol., 63: 161-163, 1907.

38. Craig, C. F.: Observations upon Endamoebae of the Mouth. I. Endamoeba Gingivalis (Buccalis), J. Infec. Dis., 18:220-238, 1916.

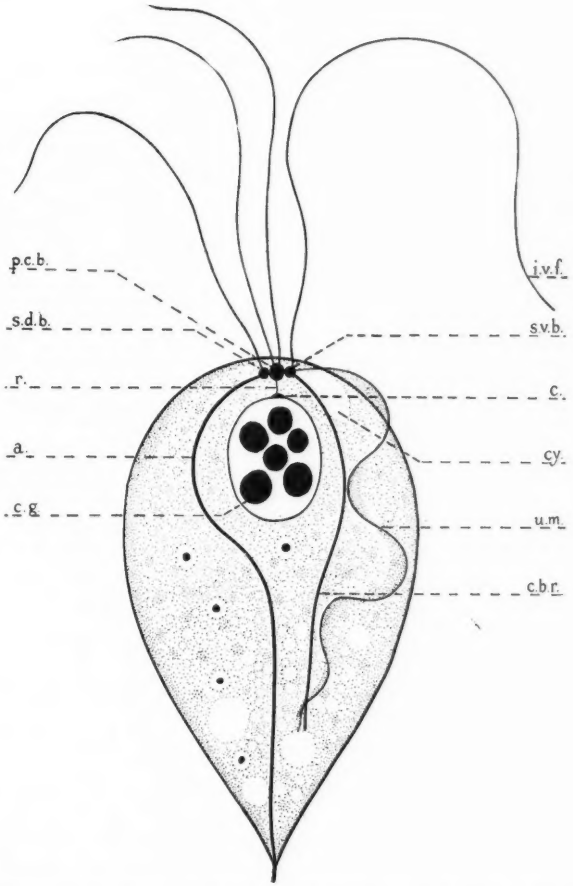

Fig. 2.—Diagrammatic figure of right side of Trichomonas buccalis (Goodey) Kofoid; from stained preparation in culture. *a*, axostyle; *c*, centrosome; *cbr*, chromatic basal rod; *cg*, chromatin granules; *cy*, cytostome; *ivf*, independent ventral flagellum; *pcb*, primary central blepharoplast; *r*, rhizoplast; *sdb*, secondary dorsal blepharoplast; *svb*, secondary central blepharoplast; *um*, undulating membrane.

macrohyalina Tibaldi (1920)[39] are probably identical with *E. gingivalis*. Craig[40] refutes his description of *E. confusa*,[38] stating that the amebae that he described were merely the smallest forms of *E. gingivalis*. In 1920, Tibaldi[39] described an ameba obtained from the tonsil. This probably is no other than *E. gingivalis*, which has been shown by Smith, Middleton and Barrett[41] to invade inflamed tonsils. As suggested by Kofoid and Swezy,[16] the contractile vacuole, reported by Tibaldi, may have been only a discharging food vacuole. The many names that have been given are probably the results of observations on degenerate amebae, as has been the case with *E. dysenteriae* and other intestinal forms. It has been suggested that *E. dysenteriae* may invade the mouth, and that it is identical with *E. gingivalis*, but this has been conclusively shown not to be the case by Kofoid and Swezy,[16] a conclusion later proposed by Wenyon.[42]

TRICHOMONAS BUCCALIS

Trichomonas buccalis is a very common animal parasite of the gingival sulcus of diseased mouths of man and the dog. It belongs to the primitive class of one-cell animals commonly called flagellates, so named because of their locomotion by means of long slender whiplike flagella (Fig. 2). Little was known about this very common parasite until within the last two years.

No critical morphologic account of *Trichomonas buccalis* has appeared in the literature previous to that of Hinshaw.[43] Mitotic division was reported then for the first time in the species. The prevalence of this widespread infection of the human mouth was not realized before the work of Hinshaw.[44] Experimental inoculation of animals had not been accomplished previous to his work of 1928.[32] Cultivation *in vitro* was accomplished by Lynch,[45] Ohira and Noguchi[46] and Hogue.[47] These were brief reports permitting of no general conclusions. A more extensive work on observations *in vitro* is that of Hinshaw published in 1927.[48]

Historical Review.—O. F. Müller,[49]

39. Tibaldi, E.: Sopra una nuova specie di ameba parasita trovato nelle tonsille (*Entamoeba macrohyalina*), Ann. d. ig., 30:613-621, 1920.

40. Craig, C. F.: Manual of the Parasitic Protozoa of Man, Philadelphia: J. B. Lippincott Company, 1926.

41. Smith, A. J.; Middleton, W. S., and Barrett, M. T.: Tonsils as a Habitat of Oral Endamebiasis, J. A. M. A., 63:1746-1749, 1914.

42. Wenyon, C. M.: Protozoology. A manual for Medical Men, Veterinarians and Zoologists, New York: William Wood & Company, 1926.

43. Hinshaw, H. C.: Morphology and Mitosis of Trichomonas Buccalis (Goodey) Kofoid, Univ. Calif. Publ. Zool., 29:159-174, 1926.

44. Hinshaw, H. C.: Correlation of Protozoan Infections of the Human Mouth with Extent of Certain Lesions in Pyorrhea Alveolaris, Proc. Soc. Exper. Biol. & Med., 24:71-73, 1926.

45. Lynch, K. M.: Trichomoniasis of the Vagina and the Mouth, Cultivation of the Causative Organism and Experimental Infection, Am. J. Trop. Dis., 2:627-634, 1915.

46. Ohira, T., and Noguchi, H.: Cultivation of Trichomonas from the Human Mouth (Tetratrichomonas Hominis), J. Exper. Med., 25:341-347, 1917.

47. Hogue, M. J.: Studies on Trichomonas Buccalis, Am. J. Trop. Med., 6:75-88, 1926.

48. Hinshaw, H. C.: Cultivation of Trichomonas Buccalis, a Protozoan of the Human Mouth, Univ. Calif. Publ. Zool., 31:31-51, 1927.

49. Müller, O. F.: Vermium terrestrium et fluviatilium, sen animalium infusiorium, helminthocorum et testaceorum, non marinorum, succincta historia (Havniae et Lipsiae, Heineck et Taber). 1:(1)30-135; 1 (2):72-68; 2:214, 1773.

in 1773, described a pear-shaped organism occurring in the human mouth to which he gave the name *Cercaria tenax,* thus identifying it with a genus now known to represent a developmental stage in the life cycle of certain trematode worms. Since no organism other than *Trichomonas buccalis* even remotely resembling a cercaria occurs in the human mouth, it is probable that Müller (Kofoid[50]) was the first to record this infection.

According to Doflein,[34] Steinberg[2] was the next to deal with this flagellate. He named three species from the mouth, *Trichomonas elongata, T. caudata* and *T. flagellata.* His publication is in an inaccessible journal in the Russian language. There is no doubt that his conclusions regarding the number of species were incorrect, for no subsequent investigator has succeeded in confirming them. The differences between his three alleged species were entirely quantitative characteristics, such as shape and size. He detected no qualitative differences.

Several observers have regarded *Trichomonas buccalis* as identical with a similar organism occurring in the human intestine, *T. hominis* (Prowazek,[46] Doflein,[34] Ohira and Noguchi[40]). It is more closely related to *T. vaginalis* of the human vagina, described by Donne,[51] than to any other species of the genus. The latter is the type species of the genus, and if the three species are to be regarded as one, the name *T. vaginalis* must be used.

50. Kofoid, C. A.: Critical Review of the Nomenclature of Human Intestinal Flagellates, Cercomonas, Chilomastix, Trichomonas, Tetratrichomonas and Giardia, Univ. Calif. Publ. Zool., 20:145-168, 1920.

51. Donné, A.: Recherches microscopiques sur la nature des mucus et la matière des divers écoulements des organs genitourinaires chez l'homme et chez la femme, Paris: Chevalier, 1837.

The cytologic work of Hegner[52] on the latter species when compared with our own work on *T. buccalis* (Hinshaw[43]), shows sufficiently striking differences to warrant specific separation. Unpublished cultural work done by one of us (H. G. J.) indicates that the two latter species are specifically distinct.

It is difficult to classify the trichomonads reported from cases of gastric cancer and still more difficult to place those reported from the esophagus (Doflein[34]). It is probable that these are derived from the mouth, as a descending infection is easier to imagine than an ascending one, especially since *Trichomonas hominis* of the intestine normally lives in the lower portions of the alimentary canal. However, an ascending infection is not impossible. In this connection there should be mentioned trichomonads from the sputum and lungs of persons afflicted with tuberculous pulmonary phthisis, pulminary gangrene and putrid bronchitis (Schmidt[53]). Schmidt gave the name *T. pulmonalis* to these forms, but most reviewers have regarded them as identical with *T. buccalis.*

It was not until 1917 that the accepted specific name was given for the trichomonad flagellate of the mouth. Goodey[54] gave the organism the name *Tetratrichomonas buccalis.* This paper was appended to a joint paper by Goodey and Wellings,[20] and most reviewers have ascribed the authorship of the species to these two; whereas, the technical authority for the species is Goodey alone.

52. Hegner, R. W.: Trichomonas vaginalis Donné, Am. J. Hyg., 5:302-308, 1925.

53. Schmidt, A: Ueber parasitäre Protozoen. Trichomonas pulmonalis, Münch. Med. Wchnschr., 42:1181-1182, 1895.

54. Goodey, T.: Note on the Trichomonad Flagellate Tetratrichomonas Buccalis, N. Sp., Parasitology, 9:554-557, 1917.

Little evidence regarding the pathogenicity of these parasites is recorded in the literature. The intestinal form is often considered harmless. Some consider the flagellate of the vagina to be pathogenic, it being found commonly in leukorrhea when the discharge is acid in reaction. Lynch[45] regarded trichomonads found in the mouth and vagina as pathogenic. Seven years later (Lynch[55]), he expresses considerable doubt as to their rôle in diseases of the intestine, genital tract and buccal cavity.

Occurrence.—This parasite of the human mouth is usually considered relatively rare and of sporadic occurrence, if one may judge by the infrequent references in the literature on the microbiology of the mouth. This widespread conception is based largely upon inadequate technic. Dried smears stained with eosin-methylene blue or other stain have been depended on too frequently to give us an idea of the protozoology of the buccal cavity. *Trichomonas buccalis* is an extremely delicate organism, not readily demonstrated by such technic. Even the use of carefully fixed wet smears stained well with Heidenhain's iron hematoxylin cannot be expected to reveal more than 10 per cent of the cases of infection. Examination of material in the living state is more trustworthy than either of the foregoing methods, but many sources of error occur here. Even to the experienced eye, an active trichomonad, viewed in the seething mass of cells and bacteria with which it is associated in the mouth, may be readily mistaken for a salivary corpuscle agitated by actively motile spirochetes or bacteria. We have shown (Hinshaw[43]) that these parasites tend to bury themselves in the solid débris with which they are associated in the mouth, and hence escape detection. We have found that the inoculation of Boeck's medium with a small amount of the pyorrheal pus or interproximal débris followed by incubation at 37 C. for forty-eight hours reveals nearly 100 per cent more cases of infection than any other means.

To find nearly 90 per cent of our cases of advanced pyorrhea in San Quentin Prison showing infection with *Trichomonas buccalis* was startling (Hinshaw[44]). It might appear that this represents an epidemic condition within the walls of the prison. But this cannot be the case; for approximately one-half of all those cases examined were cultured at the time of the dental examination given each prisoner on admission to the institution. The incidence of trichomonad infection of pathologic mouths was fully as high in those just entering the prison as in those who had resided there for months and years. It will be observed that the incidence of typical advanced pyorrhea in this institution is unusually high. It is significantly lower in those who were just entering. The crowded conditions, with a multiplicity of contacts, together, possibly, with deficient diets, are in part responsible for this contrast. The age factor is an extremely important one, and residents of the institution are on the average older than those just entering.

Our examination of persons outside San Quentin has been largely confined to students. We met with few cases of advanced pyorrhea among these young persons, so it is not surprising that infections with *Trichomonas buccalis* were seldom found. Only three such cases were observed. One was in a male student, aged 31, who had a bad case of

55. Lynch, K. M.: Cultivation of Trichomonads and the Differentiation of the Flagellates, J. A. M. A., 79:1130-1133, 1922.

pyorrhea. Another was in a female student, aged 47, with extensive pockets and receded gingivae. She reported frequent periodic attacks of intense inflammation of the gums. The third case was in a man, aged 36. The gums were receded and some shallow pockets were present. He reported that he had formerly had several rather extensive pockets, but that careful instrumentation had recently improved the condition considerably. This infection was evidently residual from the former condition of more advanced pyorrhea. Smears from this case showed considerable quantities of pus, although the gums were macroscopically of healthy appearance. The man stated that he always brushed his teeth thoroughly five times a day.

Age is an important factor predisposing to infection with this parasite. Although the greater numbers of our patients were between the ages of 17 and 26 years, with the mode at 22, the increased incidence in older groups is striking (Fig. 3). Figure 3 represents a comparison of the incidence in each of the quartile groups of the curve. The

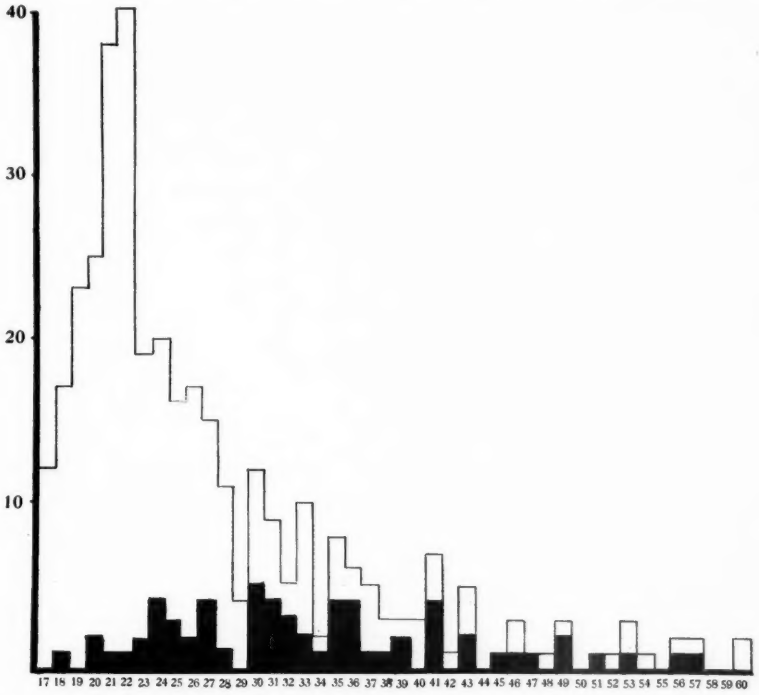

Fig. 3.—The relation of age to infection with Trichomonas buccalis. The height of each column represents the number of persons studied in each age group. The age is indicated at the base of each column. The portion of each column in black indicates the number of individuals bearing the infection.

youngest one-fourth of the population group studied had an incidence of only 3.63 per cent; the older groups, 12.47 per cent, 12.36 per cent, 42.1 per cent, respectively. More than 40 per cent of those whom we examined who were over 30 years of age were found to harbor this parasite, formerly thought to be rarely present in the human mouth.

Morphology and Reproduction.—Most published figures on *Trichomonas buccalis* are inadequate, and they are often inaccurate. The nucleus is usually represented as a solidly staining structure; whereas, when properly stained, considerable of the internal structure can be made out. The nucleus of cultural forms is usually composed of several rounded granules (Fig. 2). This organism bears an integrated neuromotor system consisting of four flagellae arising from a three-lobed blepharoplast, which also gives rise to a chromatic basal rod and an axostyle (Fig. 2). This axostyle takes basic stains as does that of *T. vaginalis* of the human vagina; whereas, other trichomonads have an axostyle which is hyaline and unstained in mounted preparations.

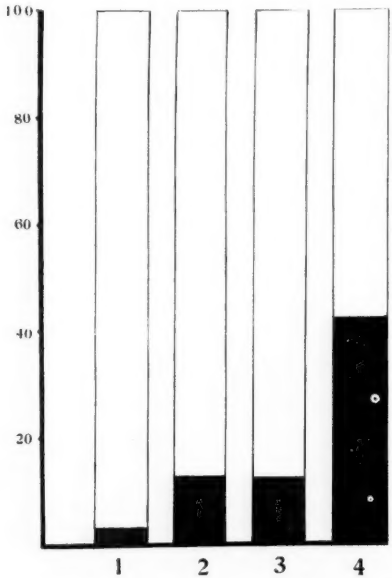

Fig. 4.—The incidence of infection with Trichomonas buccalis in each quartile of the age distribution curve of Figure 2. Column 1 represents an incidence of infection of 3.63 per cent in the youngest one-fourth of all individuals studied. The incidence of infection is 12.47, 12.36 and 42.1 per cent, respectively, in the successively older age groups (columns 2, 3 and 4).

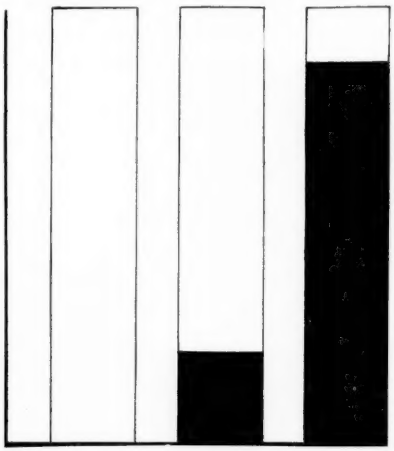

Fig. 5.—T. buccalis infections of the mouth in San Quentin Prison (superficial diagnosis). Left: Normal mouths and incipient pyorrhea. Center: Uncertain and anomalous cases. Right: Advanced pyorrhea.

Trichomonas buccalis reproduces by simple asexual fission, preceded by a true process of mitosis involving the appearance of three morphologically distinct chromosomes. The flagella are evenly divided between the two daughters, and the missing ones are regenerated. The

axostyles and chromatic basal rods are resorbed during the process of mitosis and are regenerated in each of the daughters.

Experimental Infection of Animals with Trichomonas Buccalis.—As with *Endameba gingivalis,* this animal parasite of the human mouth has not heretofore been maintained in experimental animals. The dogs and monkeys used for experimental purposes were submitted to a thorough examination over extended periods in order to preclude any possibility of spontaneous infection with this parasite. We found that of twenty-nine dogs examined for *Trichomonas buccalis,* only six bore the infection spontaneously. Hegner and Ratcliffe[56] report the finding of this parasite in twenty-two of twenty-three dogs examined. They are of the opinion that the species found in the mouth of the dogs is a distinct one and that the infection was spread by association when the dogs were allowed to run together. Hinshaw[32] successfully inoculated an old dog possessing an advanced case of gingivitis with material from a culture of *T. buccalis.* The parasite continued to multiply in the dog until he was killed fourteen and one-half months later.

Not any of the nine monkeys examined were found to harbor a trichomonad parasite of the mouth. Five of the monkeys were inoculated with materials from cultures of *Trichomonas buccalis* of the human mouth, and subsequent examinations showed that, in three of them, the infection was successful.

Cultures were taken for a period of three weeks from the vaginas of two monkeys to determine the presence of a trichomonad parasite. When it was found that no such parasite was present in either of the monkeys, culture material of *T. buccalis* from the human mouth was introduced into the vagina of each monkey. Four days later, a second introduction of material was made. Subsequent culture examinations showed no infection. Dog number 10 was inoculated subgingivally with material from a culture of *Trichomonas vaginalis* from the human vagina. Several examinations following the inoculation of this parasite into the mouth of the dog proved negative.

CONCLUSION

A definite correlation exists between the protozoa of the mouth and the inflammatory type of pyorrhea alveolaris. Experimental evidence thus far available is indicative of the possibilities of producing clinical conditions in experimental animals similar to those found in man. The time factor in experimental work with animals is as important as in the case of human infection.

56. Hegner, R., and Ratcliffe, H.: Trichomonads from the Mouth of the Dog, J. Parasitol., 14:51-53, 1927.

ANATOMY OF THE ROOT APEX IN RELATION TO TREATMENT PROBLEMS*

By EDGAR D. COOLIDGE, B.S., D.D.S., Chicago, Ill.

THE success of pulp treatment depends on a normal functional relation of the tissues surrounding the root apex. The differentiation between the normal and the pathologic condition in the region of the root apex is to a certain extent determined by the interpretation of the roentgenogram. However limited this means of diagnosis may be, it, more than anything else, offers clinical aid at the present time. In studying histologic sections of many roots of teeth containing pulps or root canal fillings, many things may be observed which are of practical value to the practitioner.

The anatomic relation of the pulp and periodontal tissues to the hard tissue, the dentin, cementum and alveolar bone is of vital importance to the operator. The prevailing opinion that the root canal is constricted in the apical region is not supported by investigation, and the dividing line between the pulp and the periodontal tissue is not a fixed point to be used as a guide in operating. It has been customary to speak of the dentinocemental junction as the line or point at which the pulp tissue should be severed from the soft tissue entering the apical foramen. Not only is such a dividing line imaginary, but the conception also is erroneous and may be misleading. It would be more accurate to speak of this as the area of the apical foramen and disregard the variable position of the junction between cementum and dentin. Connective tissue cells capable of producing secondary deposits of dentin-like or cementum-like substance at the apex may be so closely related that it would be extremely difficult to differentiate between them and their product.

Figure 1 is from the apex of a dog's tooth containing a vital pulp. The pulp cavity in the canal occupies most of the root. Along each side of the root, a thin wall of dentin can be seen which is covered on the outside by a very thin layer of cementum. As the apex is approached, the dentin becomes thinner and the cementum becomes thicker, while the cementum is the only hard substance forming the apex of the root. The dentin ends on the sides and the pulp extremity is covered by cementum through which numerous vessels can be seen entering. Pictures similar to this have been the basis of a conception of apical tissue relationship that has prevailed for some time and is misleading to the operator. Such islands of cementum as are here shown have not been found by us in human teeth. As will be seen in the accompanying illustrations from human teeth, the location of the dentinocemental junction is so variable that to use it as a guide

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*From the Research Department (Director, Balint Orban) of the Chicago College of Dental Surgery, Dental Department of Loyola University.

in the removal of pulp tissue and the filling of the canal would be of little help to the operator except to convey an idea of proximity to the apical region.

In Figure 2 can be seen a section of the apex of a human bicuspid from a man, aged 49. The character of the tissue entering the apical foramen appears very similar to that quite well up in the canal. The sides of the canal are about parallel and at the extreme tip they diverge rather than constrict. A thick layer of cementum can be seen to end quite abruptly outside the dentinal orifice of the foramen.

Figure 3 shows an apical area of particular interest to an operator. The parallel walls of dentin show little change in the shape of the canal of this upper central incisor even at its extremity. The character of the tissue as far up in the canal as is shown in the illustration appears the same as it does before entering the canal. Can one easily determine at what point, or line, the pulp tissue begins? In the removal of the pulp in

Fig. 1.—A dog's tooth, showing the apex formed by cementum.

such a case, it would matter little whether it were cut off at the foramen or 2 or 3 mm. up in the canal as long as the remaining tissue were not infected nor seriously traumatized during the operation. In this case, it is difficult to determine at what point the cementum does not cover the dentin at the apex. The walls of the canal are parallel even to the foramen. Here again, the character of the tissue entering the foramen appears the same as that farther up in the canal. The cementum here is seen to cover completely the tip of the dentin walls, but extends higher on one side than on the other, so that a diagonal

Fig. 2.—The apex of a human bicuspid with diverging apical foramen.

cementum on the outer side of the root is quite thick and can be seen covering the end of the dentin on one side and, tapering off quite rapidly on each side of the foramen, soon becomes indistinct.

In Figure 4, a similar relation of the tissues is seen as in Figure 3, in that the line could be made connecting the two points. This is a central incisor of a human being, 30 years of age. On the left side of the canal above the foramen, an elevation on the pulpal wall can be seen. It is quite possible that this elevation would constitute an obstruction to in-

strumentation in root-canal treatment and that the broach would probably stop at this point.

Widely divergent canal openings are seen in Figures 5 and 6. Thick layers of cementum have been laid down one upon another. It will be noticed that the layers of cementum are much thicker at the right in each illustration, which may indicate the possibility of some functional influence as the cause. It also indicates the well advanced age of the patient, which was 50 years. The divergent foramen in each of these bicuspid teeth is entirely made by the cementum, and many connective tissue fibers are attached to this cementum. It is evident that such a line as the dentinocemental junction, even in a case in which the cementum is as thick as in these specimens, is of no practical use to the operator.

The main canal in Figure 7, from a cuspid of a 25-year-old human being, is seen to open at the side of the root, while only a small branch is seen penetrating toward the apex of the root. In this curved canal, a constriction seems to be present as the orifice is approached, which

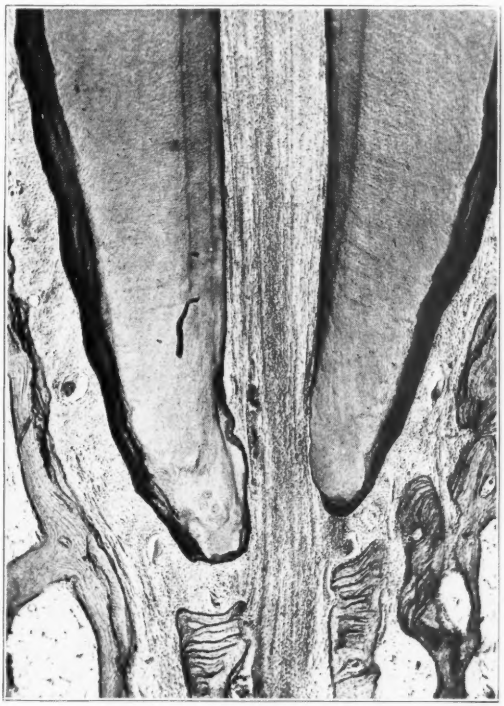

Fig. 3.—A human central incisor. The walls of the canal are parallel. The dentinocemental junction cannot be distinguished. The character of the tissue in the canal is the same as that beyond the apex.

may be due to the oblique section. It is difficult to trace the cementum on the surface of the root below the foramen in this illustration. A small and curved branch of the main canal is seen running toward the apex of the root; which would certainly add some difficult complications to the treatment of the canal if infection were present. The main problem in such a case would be that of disinfection. However, in the removal of a vital pulp such inaccessible branches might undergo certain changes which would lead to the obliteration of this accessory canal.

Figures 8 and 9 are the same root as Figure 7 showing different sections of the same series. The canal is seen to curve to the side and does not reach the apex of the root. The cementum is thin and does not enter the canal to any extent. The pulp tissue is quite fibrous. A small denticle or pulp stone lies up in the canal partly imbedded in the dentin. In another section of the same canal, several denticles are seen. Between these denticles lies a blood vessel filled with coagulated serum. These pulp stones would probably prevent instrumentation beyond this level.

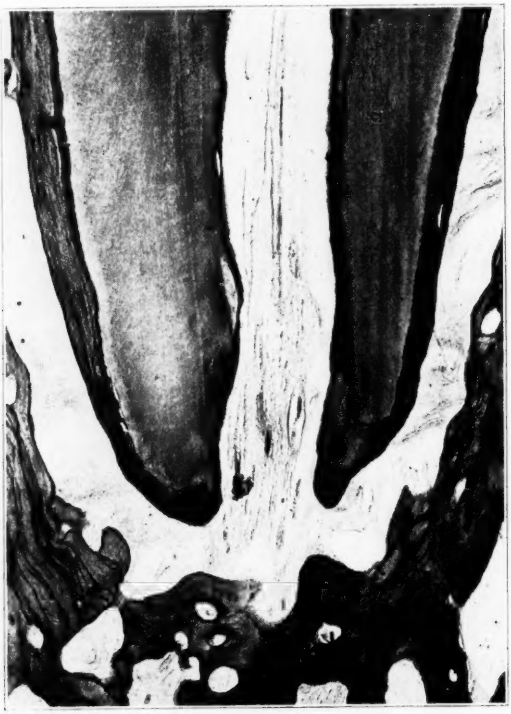

Fig. 4.—Apex of a central incisor of a human being. There is no constriction at the apex.

Fig. 5.—Divergent apex of a human bicuspid. The apical foramen is formed by cementum.

Fig. 6.—Apex of a human bicuspid. The widely divergent apex is formed by cementum, but the dentinocemental junction could not be found in an operation.

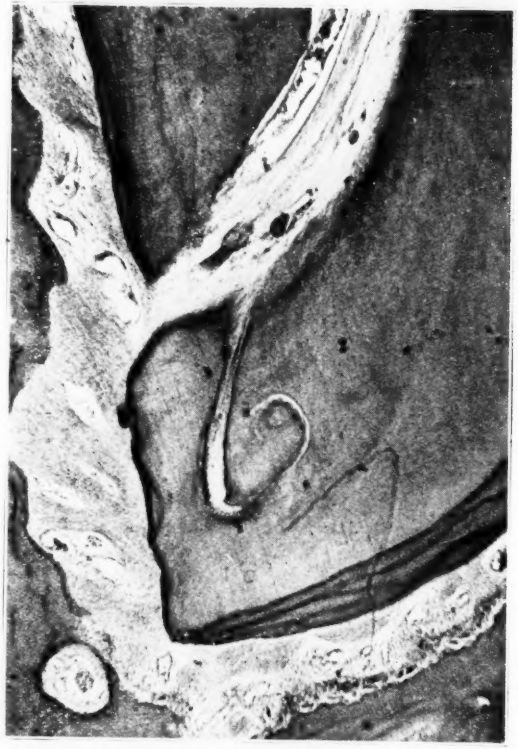

Fig. 7.—Apex of a human cuspid. The apical foramen is on the side of the root. An accessory canal emerges from the main canal, but does not open at the apex.

Fig. 8.—Tooth shown in Figure 7; a denticle higher up in the ca. al.

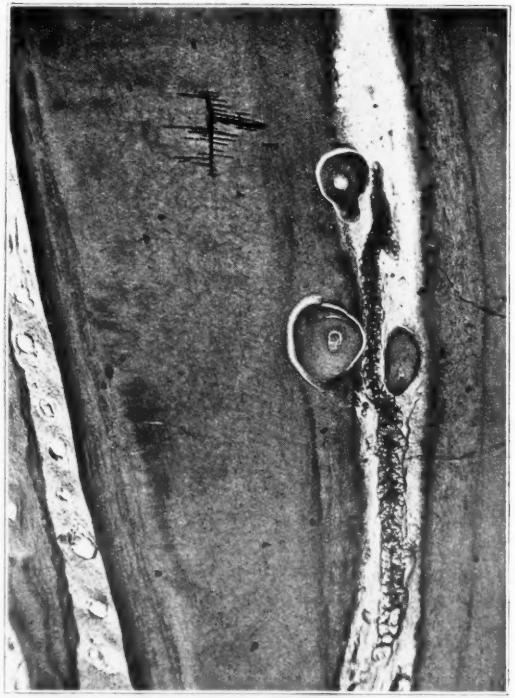

Fig. 9.—Tooth shown in Figures 7 and 8; several denticles in the canal. (Another section of the same series.)

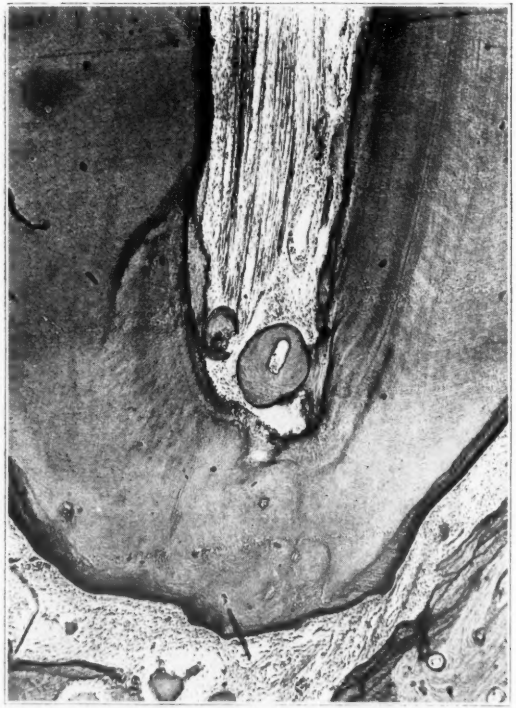

Fig. 10.—Adherent denticles in the apex of a human bicuspid. The foramen is not seen in this section because of the curved canal.

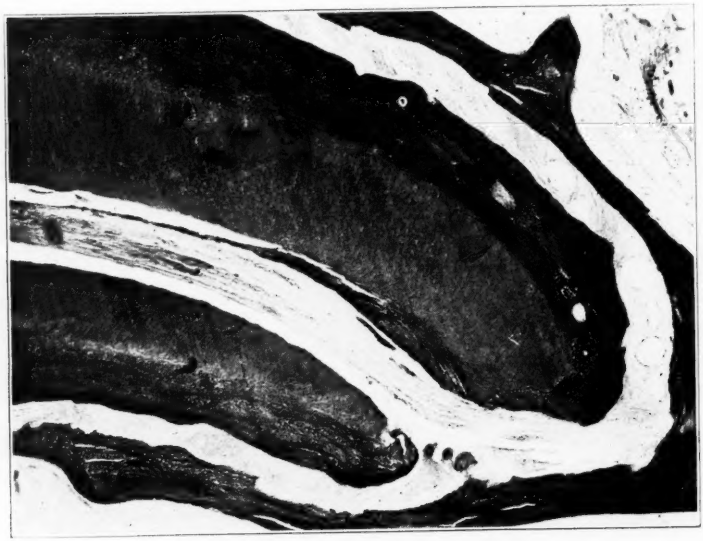

Fig. 12.—Apex of a human tooth. The curved canal opens at the side of the root.

Fig. 11.—Mesial root apex of a lower second molar. The dentinocemental junction could not be used as a guide in operation.

In Figure 10, which is from the tooth of a 46-year-old man, some small denticles are seen near the apex of the root partly attached to the wall of the canal. The canal evidently curves to the side and consequently is not shown at the foramen. These calcifications would obstruct the instruments in pulp removal so that the apical foramen could not be reached.

Another curved canal is to be seen in Figure 11, which is from the mesial root of a lower second molar, where the dentinocemental junction could not be used as the guide in pulp removal. It would be very difficult to reach the foramen of this canal by instrumentation because of the curve and irregularity in the canal surface.

Figure 12 shows a curved canal in a tooth of a 24-year-old human being. It is very doubtful that successful instrumentation could be carried out beyond the rather acute angle near the apex, and the pulp would be amputated at that point. The chances of success of the canal filling would probably be just as great as it would be if the pulp tissue should be severed a little closer to the apex. The most important thing would be to remove all infection and fill to the point at which the tissues were severed.

The presence of infection in inaccessible canals appears at once as an impossible barrier to root-canal treatment and successful canal filling. It seems to us that successful disinfection of all inaccessible canals may be accomplished by applying the principles of "penetration" of germicides, which, if they do not coagulate protein material, will penetrate; while those which coagulate or combine with protoplasm have a self-limiting action, and do not penetrate.

CONCLUSION AND SUMMARY

The apex of human teeth is formed quite differently from the apex of a dog's tooth and the pulp tissue in these human teeth enters the canal in a large bundle of blood vessels, nerves and connective tissue. The main canal may have branches, with other foramina, which probably contain similar tissue. The dentinocemental junction is an extremely variable point at the orifice of the canal. In some teeth, the cementum forms the foramen and, in others, it does not. It would seem that the success of a root-canal filling does not depend on the removal of the pulp to any definite point, but it should be amputated close to the apical foramen. Curved canals, inaccessible branches of the main canal and roots containing calcifications offer increased difficulties to root-canal operations, but such difficulties do not seem to prevent successful results if all infection is destroyed within the remaining tissue and the canal carefully filled to the surface of the pulp stump.

THE PRACTICAL THINGS EVERY DENTIST SHOULD KNOW REGARDING THE TREATMENT OF PERIODONTOCLASIA*

By THOMAS B. HARTZELL, M.D., D.M.D., F.A.C.D., Minneapolis, Minn.

SPEAKING of youth and health, Frederick L. Collins says in the *Delineator* for December, 1928:

> There is a continuing, and sometimes amusing, rivalry between branches of the medical profession to see which can do the most to help us to retain our youth. Lately, the dentists have, so to speak, taken the bit in their teeth. There are fifty thousand of them, and according to a writer in the New York *Evening Post*, they could, if properly financed and educated, do more to insure the health, wealth and happiness of our one hundred and fifteen million people than any other profession. They are the custodians of machinery which grinds thirty-seven billion dollars' worth of food every year. And the importance of their function is modestly stated in these words: "The health measures of physicians to prevent disease might be almost eliminated if the teeth of the nation were kept in perfect condition from childhood on for a generation or two."

The average person will be slow to accept that last statement. It seems hardly credible that one could escape paying doctors anything by paying dentists more. But there is growing recognition of the truth of the old saying that you must be true to your teeth or they will be false to you. And there is significance in the proposal of Professor Gies of Columbia University for a system of tooth insurance.

Periodontoclasia, until quite recently called pyorrhea alveolaris, is a more nearly universal human ailment than any other with which the healing art is concerned. It is even more common than dental caries. For many years, there has existed a great diversity of opinion regarding the possibility of effectively checking its ravages. So great has been the skepticism of the average dentist that comparatively few men can say with confidence to their patients that they can cure the disease or, let us say more conservatively, assure their patients that they can, with the patient's cooperation, bring about a permanent cure. By a permanent cure, I mean complete healing of the ulcerating lesions, a new epithelium cleanly covering the previous ulcer existing around the tooth. Because of this skepticism in the mind of the dentist, he frequently contents himself with administering only to the patient's dental needs which arise from caries and with the removal of teeth afflicted with pyorrhea or abscess and their subsequent replacement by artificial substitutes. Therefore, I am going to address my remarks to this skeptical group of dentists who regard the treatment of pyorrhea alveolaris as a waste of time.

Periodontoclasia, in which pyorrhea is the principal symptom, depends, for its cause and progress, on the active growth and invasion of the tissues by the common pyogenic organisms, notably the streptococcus and the staphylococcus. These

*Read before the Minnesota State Dental Society, March 7, 1929.

organisms accumulate in such masses on the sides of the teeth that, by multiplication, they penetrate the gingival crevice, where they pour out their ferment and dissolve the epithelium lining the crevice, thus gaining ready entrance to the tissues and soon entering both venous and lymphatic capillaries. In the tissues, their toxins cause cloudy swelling of all the fixed cells with which they come in contact. This, first of all, means that the movement of blood through these tissues is inhibited, with swelling and lessened oxygen consumption resulting, the gingival edges taking on a purplish hue. And it necessarily follows that fewer leukocytes are enabled to reach the area undergoing inflammation. This certainly means that the bacterial invasion will be poorly met, and the rapid growth of an increasing number of bacteria is thus favored. I stated a few moments ago that the micro-organisms responsible for this disease were the pyogenic organisms. I arrived at this conclusion as follows:

I have collected and caused to be collected by others all the bacteria that could be secured by squeezing and curetting the surfaces of pyorrheal ulcers, subsequently planting these bacteria in many different kinds of culture mediums and studying their resultant development. Next, I have, in like manner, collected pus from many pyorrhea pockets, and having injected the whole mass into the tissues of laboratory animals, I have observed the reaction of the animal tissues to the presence of these bacteria. Then I have cut away the overlapping ulcers created about tooth sockets becoming pyorrheic and have studied these tissues under the microscope in two different ways: first, staining one series of sections of such gum tissues to show the character of cellular change in the lesions, and, secondly, staining a similar series from the same block of tissues to show the bacteria present both on the surface of the sore and scattered among the cells of the tissue.

The results of these studies have been briefly this: The lesions invariably found in the invaded tissues are those commonly resulting from the activity of the pyogenic bacteria, whether they are growing in the gum tissue, the striated muscle tissue or among the fibers of the heart muscle or in the surface of the mucous membrane. They have those common characteristics which show the action of the pyogenic bacteria. Again, the animals injected with all the pus collected from pyorrhea pockets in the resultant lesions reveal only pyogenic bacteria either by culture or staining and studying them in the tissues themselves. None of the other bacteria found in smears in the pus of pyorrhea pockets survive in the tissues. They are of so little pathogenic importance that they can be ignored.

It is true that we occasionally find the tubercle bacillus in the mouth, but only where this bacillus has invaded the lung or some other part of the body from which it can migrate into the mouth. It is also true that we often obtain considerable numbers of pneumococci from about the teeth, but as a rule they are rapidly destroyed and do not cause lesions in our animals. *Bacillus fusiformis,* both the lance shaped and its relapsing thread-form, is commonly found, but in view of the fact that it does not under ordinary conditions destroy tissues, it can also be ignored. There are many other bacteria that occasionally are found in the mouth. Thus far, I can testify that they are of no importance as a cause of disease in the tissues of laboratory animals. Therefore, the problem of overcoming pyorrheal periodontoclasia resolves itself into preventing the growth

and accumulation of these pyogenic micro-organisms on the sides of the teeth near their investing tissues.

I am thankful to say that this is not at all the difficult problem that the dental profession at large believes it to be. We now recognize two main avenues by which to attack this problem, and it is worth while to consider them both briefly. As a result of the fact that we have these two avenues of attack, there has grown up two schools of thought in our profession. One of these schools believes that the proper or most successful method of combating mouth infection is through or by the prescription of proper diet. Volumes and volumes have been written on this subject, and there is unquestionably a world of truth in the general proposition that perfectly balanced rations, both solid and liquid, underlie and form the foundation of good health not only of the mouth and jaws, but also of the whole body.

There are a great many research workers in this field now who have shown this general statement to be a fact, and there are a considerable number of mass experiments, though not strictly speaking initiated for their experimental value, which show the truth of the contention that a properly fed body is more resistant to disease than an improperly fed body. Take, for instance, the men composing the officers and crew of the *Crown Prince Wilhelm* interned during the war[1]: Because of the fact that so many of the men were so ill that they could not work the ship, they were compelled to put into port, and this, notwithstanding the fact that they had an abundance of what is called excellent food: sugar, flour, wheat, fresh beef and potatoes. They lacked some of the very important vitamins. My recollection is that 112 of these men were in the sick bay and more than half of those remaining on their feet were incapable of assisting in the working of their ship, and when these men were interned, and were fed on a mixed diet of vegetables and fresh fruits, they all rapidly recovered. Again, there is the story of the building of the Madeira Railroad, during which more than 6,000 men died of improper diet, which was largely jerked beef and carbohydrates. Then we have the numerous examples of men who have equipped crews to invade the arctic regions and have shown such foresight in providing properly balanced rations for their long stay in the arctic circle, that they have experienced little or no ill health; notably in the last expedition of Donald D. MacMillan.

I could tell you of the work of not less than a dozen people who have been striving in this field of nutrition whose work all points in this one direction. Notwithstanding, I am here to say to you that I have never yet seen a case of active pyorrhea cured by dietetic means only. When once pyorrhea has become well started and the pockets have become deep, I have never been able to diminish the inflammation sufficiently by the most rigidly observed diets advocated by the numerous authors who contend that disease can be limited or cured by diet.

On the other hand, I am glad to make this statement: It is entirely possible to bring about a complete healing of pyorrheal lesions around teeth if one can gain the cooperation of his patient in securing moderate freedom from bacterial growth by friction on the sides of the teeth adjacent to the gums, associated with a vigorous twice daily stimulation of the gums by friction and pressure. To this, I will add that when once a pyorrhea pocket has been dissolved into the alveo-

1. Science of Eating, p. 162.

lar process by the ferments of pus-forming bacteria, we must do one more thing than is above noted: We must, in some manner or by some process, reduce the depth of the lesions enough that when bacterial invasion from the tooth sides has been stopped the epithelium can and will grow to the bottom of the pocket or crevice. I make this statement because long experience has taught me that we can maintain intact the epithelium lining a normal gingival crevice if we can cut off pus-forming bacteria from continuous invasion of that crevice.

If the crevice has been so deepened by pyogenic ferments that the lesion has now become several times as deep as a normal gingival crevice, we cannot expect the epithelium to project itself to its bottom. Therefore, the problem of gaining a permanent cure of pyorrhea rests on: (1) reduction and detoxification of the bacterial products on tooth surfaces adjacent to the tissues so that there is not enough destructive ferment being formed to continue the solution of the tissue; (2) emptying the congested capillaries of the poorly oxygenated blood which has accumulated in them and distended them as the result of cloudy swelling of all the tissue cells surrounding them, which constricts the capillaries, which should drain this tissue to such a degree that the capillary ends are distended and filled with blood cells.

The emptying of the congested tissue of blood, which is very simple, may be brought about in several different ways. The toothbrush bristles should be placed parallel to the teeth and pressed slowly down against the gum, at the same time being pressed in between the teeth. This pressure on the gum empties the tissues and for the instant blanches it so that, if the brush is quickly removed, the gum appears white. If this simple act is many times repeated, the tissues rapidly take on the color of health. When the sides of the toothbrush bristles are pressed down against the gum and pushed well in between the teeth, delivering 5 or 10 pounds of pressure to the gum, and if, when the bristles are in this position, the toothbrush handle is pushed back and forth with the bristles thus resting heavily on the gum, another valuable effect is gained; namely, friction is made on the epithelium, producing growth and thickening of the epithelial body, which will better protect the investing tissues about the teeth from further invasion and also aid in the making and breaking of pressure on these tissues.

To one who has never practiced this simple method, a great surprise is in store. It accomplishes these three things: (1) rubs off the bacteria from the tooth surfaces; (2) makes alternating pressure and release on the swollen gum, thus emptying it of congested blood, and (3) makes enough friction on the epithelium to thicken it. The change from evident disease to health will be so clear cut that the patient will himself comment on it, and I know of no reason except one why every patient should not adopt this régimé, and that is that this procedure so greatly reduces the incidence of caries and pyorrhea that if the method is consistently taught, twice as many patients are required to keep a man busy as would be needed otherwise.

One of the most valuable discoveries of recent years to us as dentists and patients is the detoxifying value of sodium ricinoleate; for sodium ricinoleate is beyond question a harmless and effective detoxifying agent. In proof of this fact, W. P. Larson and I have injected in a guinea-pig an amount of tetanus toxin sufficient to kill it in eighteen hours and have at the same time mixed 100 times

as much tetanus toxin with 1 per cent of this detoxifying agent in distilled water and administered it to a second guinea-pig, and the latter has been absolutely unaffected by the enormous dose of tetanus, whereas its fellow receiving one one-hundredth the amount of tetanus poison without the detoxifying agent quickly dies. Advantage may now be taken of this discovery in the treatment of mouth infections of all sorts, such as diphtheria, scarlet fever, pyorrhea and aphthous stomatitis. By using a 1 per cent sodium ricinoleate in the treatment of such diseases, we greatly expedite the cure of them, and our drug manufacturers have some of them taken advantage of the repeated publication of such experiments as I have described.

I have found the detoxifying preparations of both liquid and scouring paste produced by them more satisfactory than any I have been able to compound for myself, and their formulas have all been published. This detoxifying agent, when properly prepared and used on the toothbrush so that the detoxifying agent is carried into the crevices, instantly neutralizes and renders harmless both the dissolving ferment which breaks down the tissue cell and the toxin produced by pyogenic bacteria, thus greatly speeding complete recovery. Combined with the above régimé, I have found it well worth while to so order my patients' diet that they receive a daily ration in which the minimum of sweets, fats and heavy meats is provided. And a maximum of fresh fruits and vegetables is insisted on. Among these fresh fruits, none is more valuable than the citrus fruits.

One must have enough roughage always to secure a free evacuation of the bowels twice daily. This is highly desirable. There is no good reason for permitting streptococci to grow in the lower bowel for twenty-four hours when, by a reasonable attention to diet and fluid intake, we can secure evacuation of the lower bowel every twelve hours. If this cannot be secured at once by the roughage provided by a diet that the patient can afford, two or three tablespoonsful of granular agar a day will rapidly bring about this much desired result. It is highly important to make sure that every patient receives at least 8 ounces of fluid for every 10 pounds of body weight every twenty-four hours. The consumption of this normal physiologic requirement of fluid insures that the agar will take up its full compliment of fluid, which furnishes the necessary moisture and bulk to stimulate the bowel to evacuation.

The problem of reducing pyorrhea pockets that are so deep that the epithelium cannot project itself to the bottom of them and thus completely heal these deep ulcerating lesions can be dealt with in one of several different ways. Here, as in the earlier instance cited of cure by diet and cure by medicine and manipulation, we have three distinct schools of thought. I speak of the oldest one first. This first group of men advocates the reduction of pocket depths by friction and physical exercise of the gum only, making heavy pressure and friction on the gum edges with toothbrush bristles or with the square ends of cut cotton rolls held in a kuroris or a hemostat. Both have their advantages. The toothbrush bristles will do more work than will the square-cut end of a cotton roll because they can be thrust in between the teeth and make pressure on the interdental papillae as well as friction on the sides of the teeth where bacteria so rapidly accumulate.

There is only one objection to the toothbrush method, and that is that the bristles in the toothbrush soon become

soft and fail either to give pressure to the gum or rub the sides of the teeth vigorously enough to remove the bacterial film. This can be remedied only by using more toothbrushes, discarding them as the bristles grow soft and taking new dry stiff ones to continue the work until all the teeth have been cleaned and all of the peridental gingival edge given exercise and stimulation. My customary suggestion to the patient is to buy at least a dozen brushes, half of them intended for use on the outer surfaces of the teeth and the other half of them so shaped as to make easily possible the doing of just as good work on the lingual surfaces of the teeth as straight brushes can be made to do on the buccal surfaces. None of the brushes that I have devised for this purpose are patented.

Many men seem to be afraid or ashamed to recommend a sufficient number of brushes to the patient to maintain a cure of the pyorrheic condition. This is to be regretted because, in addition to the great advantage of having a sufficient number of dry stiff brushes to stimulate all of the gingival tissues and clean all of the exposed buccal and lingual and interdental tooth surfaces effectively, we have the added advantage that brushes used in the manner above described outwear several times the same number of brushes purchased one at a time in an attempted effort to maintain the necessary freedom from bacterial ferments of the tooth sides and to give the imperatively needful exercise and stimulation to the gums. As a matter of fact, it is a great economy to have enough toothbrushes at hand to make it unnecessary for a patient ever to continue the use of one after the bristles begin to soften.

The use of cotton rolls held in a hemostat or kuroris cleans bacteria from all of the tooth surfaces that can be reached by the dry cotton more effectively than the toothbrush. Its one objection is that it cannot be projected in between the teeth, but effective pressure can be made on the gum margins wherever we can reach them in a most practical manner, and if we can induce our patients to buy and use "Capitol" toothpicks and can teach them to thrust the picks in between the teeth without injuring the gums, we attain the same end that we attain by the use of properly selected and intelligently used toothbrushes.

The toothpick can be improved for this purpose wherever the interdental spaces are sufficiently large to permit it by spinning a thin layer of cotton on the pick with thumb and finger, which causes it, when pushed in between the teeth, to gather up the bacterial mass better than either toothbrush bristles or the bare wooden pick can. Many times, I have seen cases almost entirely healed except the interdental crevices, which rapidly and completely healed when the patient begins to use cotton wrapped picks intelligently. Where it is advisable to add medication to these cleansing methods, one completely finishes the cleansing treatment by impregnating the brush, the cotton roll, the bare pick or the cotton wrapped pick with a detoxifying paste, and thus leaves the pyorrheal lesions in a most favorable position to grow new epithelium rapidly.

While I thoroughly approve the methods outlined above, I frequently find pyorrhea pockets that are so deep that, in spite of all cleansing or frictional methods, the bottoms of the lesions fail completely to heal, when we can resort, if we choose, to therapy, the actual cautery or a cauterizing drug such as that provided by Frank Lawrence of Ottawa, Kan. This can be allowed to flow on the gum edges, protecting the balance of the

tissues, either by dry sodium bicarbonate or cotton rolls moistened in a saturated solution of sodium bicarbonate to prevent the action of the drug from extending beyond the area where the tissue is to be destroyed.

This is very easily accomplished, especially with a Luer syringe with a blunt nosed platinum or gold point. If we do not wish to destroy the tissue in order to reduce the pocket in that manner, we can use zinc and potassium iodid and iodin crystals, equal parts, in enough glycerin and water to liquefy them. If we wish to make this astringent mixture still more active, we can place upon a slab two or three grains of powdered anhydrous copper sulphate, spatulating it into the foregoing mixture and repeatedly applying it in the gingival edges every other day, at the same time continuing physical exercise and stimulation with the toothbrush as above outlined.

It often so happens that pockets are so irregular and deep that even this treatment is inadequate. In that event, one may use a treatment advocated thirty years ago by Dr. Fletcher of Cincinnati and readvocated by A. W. Ward of San Francisco, and also by Arthur D. Black of Chicago; i. e., actually to cut away the pockets and, where the bony edge of the pockets is irregular, to cut or bur it away into pleasing ovals.

Dr. Ward has given us a preparation for guarding these edges which he calls "wondrpak," which is very effective. I believe that it consists of zinc oxid and finely ground calcined asbestos powder mixed into a stiff paste with oil of cloves and pressed into the corner made by cutting away the tissues so as to fill the space formerly filled by the cut-away tissues. This dressing material is so adherent to the tooth's surface that it will often remain for many days, and I have yet to see suppuration occur under it. If the patient accidentally loses a part of it, it can be easily replaced. It is a most comfortable and satisfactory dressing for cut gum edges, where surgery, to reduce the pocket depth, has been utilized. From two to three weeks is required to enable the epithelium to cover the cut edges.

Traumatic occlusion has been much talked about as the cause of pyorrhea, and traumatic occlusion whenever found should be corrected. It is not necessarily a cause of pyorrhea any more than a knock or bruise on tissue elsewhere may cause infection. It is true that bruised tissue is more easily invaded and damaged by infection than if the circulation in the tissue is going on normally, and traumatic occlusion does cause osteoclasis, even though there be no infection. It does not however destroy the tissue fibers of the peridental membrane, but it certainly makes these tissue fibers more susceptible to invasion and destruction than if the circulation were going on normally in the membrane, so I distinguish sharply between periodontoclasis initiated by bruising or traumatic occlusion without infection and the solution of tissue by bacterial ferments produced by pyogenic bacteria. They are two distinctly different causes, which behave in two different ways. We may have one without the other; we may have them operating together; and the keen diagnostician should always recognize either or both and treat his case accordingly.

There is much being said and written nowadays in regard to the use of light modalities in the treatment of mouth infection, the roentgen ray and ultraviolet light particularly. The manufacturers of ultraviolet light devices have been particularly active, and a few men here and there throughout the country have written what seem to be brilliant reports

of the successful use of these various lights in the treatment and cure of pyorrhea. Far be it from me to attempt either to credit or discredit the remarkable claims made for light modalities by both manufacturers and certain enthusiastic practitioners. I shall, therefore, content myself by giving a brief chapter from my own experience.

I secured from Noyes Brothers & Cutler, of St. Paul, a Curay lamp. I at present have this lamp and the bill for the same was $35. Its ultraviolet light is produced through the heating of the wire in just such an ordinary electric bulb as is used in the headlights of automobiles, a very simple device, delivering its light through a quartz applicator to the tissues by gently pressing it against them. This particular device was strongly recommended for the relief of pain and for the treatment of pyorrhea. I have applied the quartz applicator for several minutes at a time to painful sockets, and have been told by patients that following its use the pain was relieved. In no single instance did the relief of the pain continue. In a short while, usually a few minutes, the pain returned in full volume. Applied to the gums, from three to five minutes at a spot, many different times, it has left the gums, as to color and pus production, entirely unchanged.

With the more powerful sources of ultraviolet light which I have been privileged to use, my experience has been slightly different. With a mercury lamp and quartz electrode, the light being applied directly to the tissues, one can deliver so much light that a vigorous inflammation is created by it. No pain results from the application for the first few hours. At the end of twenty-four hours, the mucous membrane seems to have been destroyed, turning white and fluffy, and the tissues are painful and sore to the touch. If a sufficiently vigorous burn is made, the subsequent healing shows some improvement in the color of the tissues and a lessened flow of pus. In no single instance have I seen a new epithelium take the place of the destroyed epithelium nor the pocket completely healed. The reason for this failure to gain complete cure by the use of ultraviolet light applied in this or any other manner lies in the fact that the bacterial growth on the sides of teeth which dissolves by its ferment the tissues surrounding the teeth can never be completely stopped. These bacteria grow with such rapidity that, in the course of a few hours, enough have reaccumulated on the sides of the teeth to again cause dissolving of the tissue, again forming pus, and so deepening the lesion.

When one considers the cost of these light modalities, which to the dentist means an outlay of from $200 to $500 for the outfit, and notes the very transient benefit conferred by the use of the light, and the time expended to utilize it, and the discomfort resulting to the patient from the use of the light sufficiently long and strong enough to set up an inflammatory action in the tissue, one is impressed with the fact that, as a cure for pyorrhea, it is of comparatively little value. My own experience is that nothing can compare with the following routine in its possibility of giving complete cure to pyorrhea. I mean by that a cure that maintains a healthy firm epithelium where previously we had an ulcerating sore around the teeth, and this firm perfect epithelium a splendid pink, normal color.

Having explained just what I mean by cured pyorrhea, I wish to repeat that because of the extraordinarily rapid growth of pyogenic micro-organisms on the sides of teeth, it is absolutely essential to com-

bat this growth from day to day by rubbing off these accumulating bacteria, attempting to get the teeth as nearly free from bacteria as is possible, and at the same time delivering enough friction and pressure on the gums to empty them of congested fluid and insure a vigorous normal circulation of healthy red blood through the gums.

In all ordinary shallow pockets, this treatment of itself will insure a cure; but each patient must be taught how to judge of his own gum condition, and how to get the necessary cleanliness and stimulation that insures health. If pockets have gone deeply into the bony structure of the jaws, we must, in addition to the foregoing surgical procedure, create conditions that will enable the epithelium to cover the tissue completely and protect the gingival crevice from further invasion with a thick healthy epithelial layer. At the same time, we must make the possibility of invasion less by removing from the teeth the ever-growing bacteria, from day to day, and detoxifying while removing the toxins that have flowed from the bacteria living on the root sides sufficiently well and often enough to make impossible the further damage of the epithelium protecting the circulating blood under that epithelium from further reinvasion.

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INSTRUCTIONS TO THE EDENTULOUS IN THE USE OF DENTURES*

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IF we are to attain proficient results for our patients in the wearing of dentures, it behooves us to consider seriously the proper advice and instructions that we must give to these patients.

No matter how well our dentures fit, our patients cannot and do not get along as well as they should unless they understand their mouth conditions and the things that help or hinder the successful wearing of dentures.

They come to us with mouths that need all teeth extracted. They are torn with fear and anxiety that they are not going to use dentures successfully, that they will not look well and that their general features will be much changed. What are we going to do with these patients?

We must give them encouragement and at the same time they must understand that if we give them a correctly fitting denture with proper setting of the teeth, balanced occlusion and proper instructions in their use, with a periodical check-up that we are doing our part, they must give us their fullest cooperation and absolute confidence.

For some good reason, their teeth have been extracted, either owing to some systemic condition or to the fact that the teeth themselves are bad. We believe that we are justified in telling these patients that if they will follow

*Read before the Section on Full Dentures at the Midwinter Clinic of the Chicago Dental Society, Jan. 14, 1929.

our directions, disregarding all other advice, such as is always given these patients by their friends and acquaintances, after the setting of the dentures, they will be in a much better state of health than before the teeth were removed. Promise as little as possible at this time, but do not discourage the patient to the extent that they will refuse extraction through fear of the final results. Their general health may demand the removal of what teeth they have, regardless of the results that they achieve with their dentures.

At this time, we explain to them the measurement and the records that can be made of their mouth condition, so that we can hope to approximate their normal mouth conditions and gain for them results that will be pleasing and satisfactory. This distracts their attention from the poor results that they have seen in their friends and neighbors, and centers it on the attention that we are giving to their well-being.

At the first appointment after extraction, for a check-up of mouth conditions we start in to carry our patients to the lowest point possible in their mental attitude regarding dentures, until they almost feel that dentures are only for looks and not of much service.

Many patients that are wearing dentures for the first time, at first have the idea that they will be able to eat the very first meal with great comfort. In fact, many believe that they are going to enjoy a nice juicy steak at the first attempt. We who have gone through this matter many times know better. Many of these prospective denture patients judge results in their case by the results obtained by others who have had years of experience with dentures. This is the time for the dentist to discourage these ideas so effectively that the patient will thoroughly understand that he is not going to eat his first meal or many others to follow in any such comfort. If we can discourage the patient at this point to such an extent that he believes that he will never be able to accomplish much with his dentures, we will obtain better results in the end. This requires a great deal of confidence in the dentist on the part of the patient. It would be folly to take him to the point where he felt that you could do nothing for him, as that might mean the loss of the patient. However, by judging the patient, we are able to determine how far we can go in this matter of discouragement. It will be wiser to have the patient obtain much better results than he expected than to have the results fall short of what he anticipated. It is the difference between success and failure, both for us and our patient.

At the time snap impressions for study models are taken, we begin to build up our patients' mental attitude, teaching them the many things that they must know regarding the wearing of dentures, the cooperation necessary between dentist and patient, the need for the absolute confidence of the patient in the dentist and the results we hope to obtain. They must understand the kind of ridges that they have, the retentive possibilities of their vault and ridges as compared with ideal vaults and ridges, the muscle action and its attachment to the ridges and its action on dentures. Only with a complete understanding of these conditions are we able to obtain results that are satisfactory to both patient and dentist. The motto "Promise little and give much," is of more value in denture work than in any other phase of dentistry. Our experience in more than 500 full upper and lower cases in a period of about eight years has proved

the value of this teaching, and it is as definite a technic as any in dentistry.

Again, we have the patient who dares us to make for him dentures that will function and give service. He may not say so in that many words, but we know that is the thought uppermost in his mind. Are we going to let these patients go somewhere else, or will we go ahead, try and fail? We do not believe that either is necessary. Generally, if we fail, we do so because we did not get the cooperation of these patients.

How can we go about a matter of this kind? There are many ways. Let me cite an instance that occurred in my office in the latter part of 1928. The patient was about 55 years old, anemic and generally run down, a man who had begun to feel sorry for himself. We all know the kind. All he had had was trouble and he always had the worst of it. In fact, he was the worst kind of patient, with a bad case of pyorrhea. Cost was an item. After several consultations, he decided that he would go to another city and get his work for one-third of what my fee would be. After the first extraction at that place, by a good man, a secondary hemorrhage developed, with a great loss of blood, and as a result, he was taken to a hospital about 30 miles from where I practice. His physician there insisted that he return to me, which he did after the necessary settlement with his first dentist, who, by the way, was very glad to get rid of him. He knew that neither I nor any one else could ever make dentures for him that would function.

After the extraction, with the proper trimming of the process, a week was allowed to pass, when impressions were taken. More time was spent in trying to find some manner to get this man to work with me than in doing the work. It all seemed useless, and the case looked like a failure. About this time, a friend of his came to me for the same service, and the day he learned of that he first seemed to take any particular interest in his case. On leaving, he said a few words that gave me the key to his case: "Will Mr. X have an easy case?" I said, "No, not at all. In fact, much harder than you have, but he will get along better." He asked why. "Because," I said, "he is a man who has much patience, is persistent and will do as he is told, and he knows that he can do what others have done, whereas you know now that no one can ever make dentures for you that you can wear. In fact, he will be eating everything with his new teeth, when you are not even used to yours, and your denture will be finished at the next sitting, and his teeth are not all extracted."

It was a dare, and as with most dares, it was accepted. His retort was, "I will bet you a box of cigars, that I will take less time to learn to handle my teeth and eat with them than he will with his." It was the first ray of sunshine. From that time on, he was a different man. Here was competition with a friend, and he was out to win. He ate the first meal with them, kept them in the first night, and did everything I told him not to do. In a week, he was eating everything, and he won his bet. I cite this case only to show you, that in these extreme types, we must take advantage of everything that arises in order to make the case successful.

In the building of our dentures, we have five appointments: The first is taken up with a snap impression and general talk; the second with the impression for the models and a talk along the line of impression taking, explaining the different materials used and why we

are using the particular material in this case, showing and explaining to the patient the kind of vault and ridges his has as compared to ideal vaults and ridges, how the muscles are attached to the ridges in this case and their action on the finished case. To do this, we use a number of skulls.

At the third appointment, we take the transfer, using a face-bow, and our talk this time concerns the relative value of artificial substitutes, the teeth as compared to legs, arms, hands and eyes, and the use that we can obtain from these different artificial appliances, with a comparison of the cost of each. We also at this time explain to the patient the value of a face-bow transfer, why it should be taken and its results.

At the fourth appointment, we set up the teeth with the patient in the chair, and our talk this time is about the esthetic value of teeth, the confidence good looking teeth give, the care we are taking in the arrangement of the teeth, so that they meet the patient's individual requirements in each case, and the balance we are working for, so that they will be able to chew food without dislodging the teeth. By this time, we have the patient in a thinking mood and he understands that the making of a "set of teeth" is not a proposition of a few minutes and no particular skill, but a task that requires the greatest skill and cannot be done cheaply.

At the fifth appointment, we set the case, taking new bites, mounting and grinding in on M. M. House's mechanical grinder. Then we give the patient another general talk on what he is going to find out in a few days, and which he should know before he leaves the office. At this time, we always tell these patients that we know that they feel as though they had a mouthful of broken dishes, but if they will follow the instructions given them and do as they are told, at the end of a week they will feel better with the dentures in the mouth than without them. This we find true in every case.

Now, too, we advise them regarding the diet, the use of very small mouthfuls of soft foods, taking a great deal of time, chewing slowly and carefully, and watching each movement of the jaws. We also instruct them to return in every case in a week, regardless of how they feel, but advise them, if any sore spots develop, to return as soon as they become really painful. I say really painful because the average patient complains a great deal about a very small spot in the beginning, and a very little after a year or so, even of an extensive sore spot. Often, these spots are not an indication of overextension of the flanges, for most of us have learned to be careful of overextension, but are the results of faulty occlusion. In the correction of these areas, we must employ a systematic manner, being sure that we understand the cause of the sore spot. The relieving of flanges that are not the cause of a spot, especially on the lowers, will only cause more trouble, as we are reducing the area the base rests upon. In lower dentures, the total area is little enough, and we must conserve the seating area instead of reducing it.

In a comparison of the two types of denture cases as outlined by H. J. Horner of Pittsburgh, we find that the patient that has worn some form of denture offers an easier case than the one who has never worn a denture of any kind, even though the first patient has a much more unfavorable vault and ridge than the second. Human beings judge all things by comparison, and the second class of patient judges by com-

parison with the natural teeth when they were very serviceable. The decision attained is very unfair. The first class of patient judges by comparison with the denture that they have had before. Dr. Horner has outlined this very clearly.[1]

Finally, we give each denture patient two articles, suggestions gathered from many men and from my own experience. Neither one is entirely original with me. Let me read them to you.

ARTICLE ONE: ADVICE TO THOSE ABOUT TO WEAR ARTIFICIAL TEETH

The advice here given has been a help to others and may be a help to you. You are now about to begin to learn to do something you have never done before—to use an artificial substitute for natural organs (teeth), and how ever perfect they may be, they are not equal to the natural teeth, nor are they used in the same way.

Do not expect to acquire facility in the use of these new things at once. That comes only by practice, patience and time. You cannot learn it in a few days, or a few weeks. You will learn it a little at a time, day by day, gradually acquiring command over them. In a month or two, you should acquire a considerable degree of skill. Above all, do not become discouraged and get the notion that your experience is in any way different from that of other beginners. All others who wear artificial teeth have to go through this process of self-education. The dentist may do his part perfectly, but this is something that you have to do for yourself. No one can do it for you, and unless you do it, you teeth will not be a success. You should not allow yourself to get into the habit of leaving the teeth out. To do so is to incur a distinct loss, for no one ever learned to use a set of teeth by wearing them in the pocket or bureau drawer. You can learn to use them only by using them, just as a child learns to walk by walking, though imperfectly at first.

There are two things that will take you longer to learn than anything else, namely, talking and eating. I will consider them separately. In speaking there are certain sounds that are apt to be more difficult than others; s, x, ch and sh are the worst. A good way to overcome this difficulty is to practice reading aloud. Do it alone so there will be none to attract your attention. Read slowly and make it a point to enunciate each syllable distinctly. When you meet with a word that bothers you, stop and say it over and over until you can say it distinctly. Remember you are training the muscles to obey the will very much as a child does in learning to talk. The more this simple and easy exercise is practiced, the quicker you will be able to speak distinctly. Following this plan, most of the difficulties of speech will disappear in a few days.

Learning to eat with them will take you somewhat longer, but the principle is the same. Don't expect to eat your first meal with your new teeth just as you did with your natural teeth, nor just as someone else does who has worn artificial teeth for many years, for you won't do it; no one ever does it. I once knew a dentist who would tell patients not to yield to the temptation to take out their teeth at their first meal and they would not want to take them out the second time. This I consider bad advice, because the patient is apt to become discouraged at his failures, and get the idea that there is something wrong with the teeth or with himself. If you become discouraged and lose confidence in your ability, the teeth will not be the success they should be. Therefore, I would not advise a beginner to try to do too much at first. If you only eat part of the first meal with them, you are doing very well. Gradually increase the length of time at each meal, eating slowly, and in a few days with increased confidence and control, which comes by practice, the whole meal can be essayed. Even then, you will find you are learning something more every day, and as the days pass, increased efficiency is acquired. If you attempt to bite on a hard substance, such as an apple or an ear of corn, you will probably trip them, for this is a severe strain upon the case. It may be accomplished, however, by pressing the apple firmly upward and inward against the teeth at the moment of biting upon it. After you start to bite into the apple, keep on biting

1. Horner, H. J.: Problems of Denture Construction, Including Conduct of Practice, J. A. D. A., 13: 1460 (Oct.) 1926.

until your teeth come into contact, then break off the rest. In eating apples with our natural teeth, we bite about one half to two thirds into the apple and break off the remainder. This cannot be done successfully with artificial teeth.

Some people acquire a habit (after their teeth have been extracted) of holding a handkerchief over the mouth when in the act of laughing. If you have such a habit, you should break yourself of it at once, for the action directs the attention of the observer to the mouth; if you do not make the motion, no one will think of looking there.

Shall I keep them in at night? is a question often asked by a beginner. To this, I answer, "No, not right away, because they would keep you awake. After the first three days, provided you have followed instructions, and kept them in your mouth during the time that you were awake, you may then start to wear them nights. If you find that they awaken you, say at midnight, and after trying to go back to sleep, you find it impossible to do so, take one or both out. However, if you awaken the next night at the same time, you must fight it out for at least two hours before you give in and remove them. In most cases, you will win and will be able to go back to sleep without removing them. If, however, you are unable to go back to sleep, you may remove them at the end of the two hour period. In that way, no bad habits are formed. A bad habit repeated a few times often becomes a regular habit. We prefer to have you wear them nights if they are comfortable, but this is not a necessity.

If you find that your dentures cause a sore spot, usually somewhere along the edge of the flange, this is not an indication that the denture does not fit properly, but that there is too much pressure at that particular spot or that the teeth are striking too hard. An adjustment must be made to overcome this condition. Almost all new dentures have to be relieved to clear up this condition. Be sure and return to your dentist while the spot is still sore, not after it has gotten well, and he will know how much to relieve it. Your artificial teeth should be kept clean. To do this, they should be carefully and thoroughly scrubbed with a stiff brush at least five times a day, after each meal if practical and in the morning and evening. A tooth brush is not a good brush for this purpose. A small plate brush is much better.

In conclusion, I wish to urge you to give no heed to the teasing or joking comments of your friends. In most cases it has no serious meaning, but may arouse dissatisfaction in your mind where no cause for dissatisfaction really exists.

ARTICLE TWO: YOUR ARTIFICIAL TEETH

Your teeth have been lost because they had become so diseased they were a source of discomfort and a constant menace to your general health. You are better off with no teeth at all than with the ones you last had.

In providing you with artificial dentures, the dentist cannot promise to restore the efficiency of your own natural teeth. He can make a big improvement over the condition wherein you have no teeth at all. If he improves your condition 25 per cent, it is worth while, and if his success reaches 50 per cent, it will be more worth while.

Do not expect 100 per cent. While some patients even go so far as to say that they would not trade their artificial dentures for their own natural teeth, such a high realization cannot be hoped for in all cases. Upon receiving new dentures, the patient is taking the first step in the progress of learning some new things about his mouth and about the process of eating. A few people never do learn these things, either through lack of patience and persistence or through lack of willingness to cooperate with the dentist in overcoming minor difficulties as they appear. The dentist cannot and does not undertake to supply this patience and persistence; that is up to the patient himself. Patients who begin the wearing of dentures either unwillingly or half-heartedly seldom make a success of it. Those who approach the matter with determination, learn with surprising ease and often have quite complete mastery in a few days. Others take weeks or months —and some never learn.

The dentist cannot foretell your success. After he has made dentures to fit your mouth, only your constant application will make them efficient in use.

Upon first receiving your denture, your chief thought is that you have a mighty big mouthful of something foreign. The fullness in your mouth and around your lips and the thought that your teeth are too long will disappear in a few days, provided you will keep your dentures in your mouth for every minute you are awake. At the end of a week, you will be far more comfortable with them in

place than without them. This is due to the fact that after the teeth are extracted, the mouth and cheek muscles fall in and contract, and after your dentures are inserted, the muscles are carried back to their original position, and it takes a few days to accustom them to this new position. Until your dentures feel as if they belonged in your mouth, you are not going to be able to do much in the line of eating.

Naturally, from the fact that you have a foreign body in your mouth, you will experience an increase in the quantity of saliva for a while. This increased flow of saliva is perfectly natural and is to be expected. At all times in the past, you have had a flow of saliva constantly and you have swallowed consciously and unconsciously every minute or so to drain the mouth. When its quantity is increased by placing dentures in the mouth, simply swallow more often for a while, and in a few days the increased flow will diminish and resume normal proportion. Unless a patient learns to swallow his saliva he will not be a success as a denture patient.

Practice makes perfect, and a new denture will be about as serviceable to you as a new automobile on which you have never had any instruction. And so now with these new dentures you must not expect full efficiency and satisfaction until you have had time to learn how to use them. Some patients become very efficient in using dentures quickly, while others require months to gain the same degree of skill in their use. Some never accomplish it.

Remember that in wearing artificial dentures one is in a condition not unlike a man who must depend upon a wooden leg. Such a fellow is better off with it than without it, but he can never again run as fast or kick as high or dance as gracefully as he did when in possession of his own natural limb. You will meet some friends who wear artificial dentures who relate wonderful accomplishments with their teeth. Don't be discouraged because you cannot duplicate their achievements now. Consider first how long they have been in training, how long they have worn their dentures, and resolve that you will do as well or better when you have worn yours for as long a time.

If you are of the type that will not be discouraged by your first failures, you may try to eat with your new dentures, from the very first; however, if failures will discourage you, you had better remove your dentures for your meals, for the first two or three days. AFTER that they will feel as if they belonged to you and eating with them will not be such a hard task.

In conclusion, I wish to call your attention to an article[2] by Dr. Sears of New York entitled "Information for Denture Patients." It is very instructive and should be read by all men that do any denture work. I want to take this opportunity of thanking the men who are the leaders of our profession in this service, for the wonderful things they have done along this line of work, for their untiring and unselfish efforts, and for the help they have given me, all so willingly.

2. Sears, V. H.: Dent. Digest, 34:643 (Sept.) 1928.

ORAL ROENTGENOGRAPHY IN MAXILLARY SINUS DISEASE*

By FREDERICK F. MOLT, D.D.S., Chicago, Ill.

WHILE the roentgenogram is probably in no case the determining factor in diagnosing antrum disease, its value as a diagnostic adjunct must be recognized. The extra-oral posterior-anterior and lateral head views are frequently accepted as final, and yet neither these nor the intra-oral views may much more than suggest the possibility or probability of existing pathologic conditions. The diagnostic value is of course proportional to the quality of the roentgenogram — its clarity, contrast, sharpness and lack of distortion.

About 1918, the work of McCormack of San Francisco began to attract attention in the east. The technic used in the production of his intra-oral roentgenograms differs in several particulars from the methods usually employed. A rigid rather than a flexible film (with a stiff metal backing) is used, the sizes varying for different parts of the mouth (narrow for the anterior and wide for the posterior teeth); a rapid double emulsion film, and a 36-inch target distance, and there is some difference in angulation, especially in the upper molar regions. All exposures are made with the patient recumbent.

This technic we adopted several years ago and have used since then. It is my belief that the quality of the film is improved by the increased target distance and the consequent elimination of much secondary radiation. Distortion is in a great measure avoided by the use of the rigid films; and the obscuration of the upper molar root ends and the antrum floor by the malar shadow is reduced to a minimum by a combination of the stiff film, the distance exposure and an almost right-angle positioning of the tube.

As a large proportion of upper molar roentgenograms produced are rendered valueless for diagnostic purposes because of the obscuring malar distortion, or foreshortening, the almost invariably interpretable roentgenograms produced by using McCormack's technic are a source of gratification. Theoretically, the added target distance reduces the proportional size of the malar shadow and makes it possible, by utilizing the lower angulation, to move this shadow upward and backward.

In the cases presenting the difficult combination of low malar bone and low palate, a good result is frequently afforded by padding out the film from the teeth with a cotton roll; but even with that procedure there will be occasional cases in which it is not possible to avoid the malar obscuration.

If it is possible, we should obtain a view of the entire antrum floor and the pendant portion of the antrum intra-orally, as it has a distinct advantage over the lateral head view, which superimposes one antrum upon the other. Thus,

*Read before the Section on Radiology at the Midwinter Clinic of the Chicago Dental Society, Jan. 14, 1929.

there need be no confusion as to what is being viewed.

A lengthening of the shadow of the molars in order to obtain a view of the antrum floor situation is pardonable. Throwing the shadow down by a high angulation and foreshortening the teeth may be the only possible solution of the situation in the flat palate case, but is not desirable if it can be avoided.

Dr. Bogle, in a comprehensive paper[1] given recently before the American Society of Oral Surgeons and Exodontists, detailed his use of lipiodol in diagnostic roentgenography of the maxillary sinus in a series of cases. This solution, a preparation of oil of poppy with 40 per cent iodin by weight, is opaque to the roentgen ray and, since it is antiseptic and bland, may be used effectually in treatment as well. After injection into the maxillary sinus, either through the osteum or by puncture through the lateral nasal wall, the nose is packed tightly to prevent escape of the fluid during roentgenography.

In many cases, we find undulations of the maxillary sinus floor with some or all of the posterior teeth apparently protruding into the antrum. Assuming that these teeth are pulpless and that no line of the pericementum is discernible, it may be difficult to determine whether or not a cyst is present. This uncertainty may be increased by the presence of one or more septums in the antrum the position and shape of which often suggest the lateral outline of a cyst. In such a case, the lipiodol would outline a cyst if present, making certain the diagnosis. It would aid materially as well in determining the existence of a suspected polypoid engorgement, although many of these cases are very definitely shown without the use of this agent.

A cyst may be found to have pushed back the bony antrum floor, or it may have destroyed the bone to such a degree that there is no distinct line of demarcation and the sac is in immediate contact with the antrum lining mucosa. Necessarily, such conditions require delicate operative interference to avoid extending the antrum far beyond its original boundaries.

A comparison of intra-oral bilateral exposures will frequently reveal (as does the posterior-anterior plate) a variation in the two antrum shadows. This should cause one to suspect the possibility of maxillary sinus disease.

Unfortunately, no one of the diagnostic factors is infallible by itself when it comes to determining the actual situation. Transillumination fails in a large proportion of cases because of the interference of other structures. A history of catarrhal drainage into the nasopharynx or the nose may not be a significant fact any more than its absence may be. Nor does even a nasal wall puncture and irrigation by trocar in every case give us the desired knowledge.

Through lack of knowledge of anatomy, many cases in which swelling and pain are present in the upper bicuspid and molar region are diagnosed as "antrum infections," when actually the infection is external to the bony structures. It is unfortunate as well that in so many cases in which the antrum is accidentally opened in extraction, the misconception seems to prevail that dressing and irrigation are called for.

Most deplorable is the fact that many antrums are apparently invaded, purposely and unnecessarily. Any antrum kept open, packed and irrigated a sufficiently long time may be labeled a

1. Bogle, R. B.: An Aid in the Diagnosis of Maxillary Sinus Conditions, J. A. D. A., 16:1289 (July) 1929.

"chronic" antrum, whether or not it was perfectly healthy previous to operation.

Nevertheless, we have the statements of various authorities that in from 50 to 75 per cent of cases presenting maxillary sinusitis, a pulpless tooth or deep pyorrhea destruction is either a causative or a contributing factor. One has only to observe the routine of daily roentgenographic examinations to recognize that this is not only possible but also probable. In fact, it occasions surprise that with the dental findings as they are, there are not sinus infections in a still greater proportion of our cases.

As far back as 1914, Novitsky called attention to what he termed "antrum drain." This condition is one in which no active acute sinusitis exists, but instead there is present a low-grade infection, accompanied, perhaps, by a thickening of the ciliated membrane over the infected teeth, even a polypoid degeneration, and manifesting referred pain symptoms identical with sinus pains. This condition, then, is one in which transillumination, drainage and irrigation fail to substantiate the suspicion of existing sinus disturbance. An antrum in the condition described is of course an easy prey to any infection of nasal or pharyngeal origin.

It is logical, therefore, to suspect pulpless teeth, whether or not periapically involved, adjacent to the antrum floor as "potential" sources of sinus disturbance.

The maxillary sinus may be considered "no man's land" in itself since, in many cases, its problem is essentially one for the oral surgeon, while in others it is entirely the field of the rhinologist. It must never be overlooked under any circumstances that this sinus is only a part of the sinus area in the paranasal tract; that careless or too strenuous irrigation from the mouth may force infection into these adjacent cells, and that, in the absence of dental conditions calling for extraction, the case is better handled by the rhinologist with the Caldwell-Luc operation than by the oral surgeon.

Notwithstanding, given a necessary extraction operation, it is logical and feasible to make an exploratory or an operative entrance into the sinus with the tooth socket as part of the opening by raising a buccal mucoperiosteal flap and removing as much of the buccal antrum wall above the alveolar ridge as is necessary to achieve access for observation or curettage. The replacement and suturing of the buccal flap leaves the antrum separated from oral contamination, and the case may thereafter be handled as a rhinologic problem freed from infectious accumulation and dental sources of disease. Thus, the rhinologist and oral surgeon may frequently collaborate successfully and advantageously.

In the light of present-day knowledge and refined oral surgery technic, the practice of drilling into the antrum through a tooth socket and retaining this opening by packing with gauze or guttapercha until the union of antrum and oral mucosa has produced a permanent opening should be considered obsolete. The number of cases encountered in which, after such operative interference, antrum closure must be achieved by a pedicle flap operation makes this antiquated procedure reprehensible.

If a tooth root is forced into the antrum, it should be removed at once and the antrum closed. Under other circumstances, a healthy antrum accidentally opened should be permitted to close, with no surgery and no irrigation. If the opening remaining after extraction is too large to be closed naturally by the forming blood clot, a small vulcanite covering

should be constructed with clasps on adjacent teeth. This is far preferable to packing the wound with gauze, and infinitely to be desired over the gutta-percha stopper of older procedures.

Careful diagnosis is desirable, with surgery where indicated and as required for a definite result.

CONCLUSIONS

The value of the properly positioned and properly exposed intra-oral roentgenogram as a diagnostic aid, showing the relation of potential dental sources of infection to the antrum floor, should be emphasized.

Caution in making a diagnosis of pathologic involvement on the roentgenographic evidence is advised, until this evidence is supported by other diagnostic factors. Frequently, diagnosis should be made only in consultation with a rhinologist.

If any question remains as to the probable findings, the opening of the sinus should be effected as an "exploratory" operation. Under any circumstances, if the situation will permit (as it will in the greater proportion of cases), the buccal flap operation should be utilized to permit immediate closure.

In obscure cases, or those presenting a questionable situation, the roentgenographic use of lipiodol will frequently be of value.

The sinus area is not one to be invaded gratuitously. The individual case should be studied, and a decision made as to whether it can be handled more capably by oral-surgical or rhinologic methods. If oral surgery is indicated, it should be deliberate, sufficiently complete to avoid a recurrence of trouble and of such nature as to avoid the undesirable "permanent opening" into the mouth.

DISCUSSION

Vernon M. Leech, Chicago, Ill.: Every case of purulent antrum disease should be considered as a secondary infection from one or both of two sources, namely, oral and nasal. In the first instance, contamination comes through the agency of infected teeth; in the second, it may become a complication of a nasal infection such as an ordinary coryza or head cold, or may arise from pre-existing sinus disease, especially in the anterior ethmoid and frontal sinuses, as their normal openings into the nose beneath the middle turbinate lie close to that of the maxillary sinus. Therefore, given a case of suspected antrum infection, full roentgen-ray films of all the sinuses, as well as local ones to show the relation of the teeth to the sinus, should be made. If an examination reveals inflammatory changes at the roots of the teeth in the region of the sinus and no apparent clouding in any other sinuses, the case is likely to be an oral problem. If other sinuses are infected, they too must receive attention, and the possibility of the antrum's receiving its infection from this source should not be overlooked. May not the high percentage of cases showing a relation to regional dental infection, mentioned by Dr. Molt, be explained by the possibility that most patients referred to the exodontist or to the x-ray laboratory for dental roentgenograms, present are clinically oral cases, while most of those not so considered reach the rhinologist on account of other nasal or sinus involvement? I believe irrigation to be of greater diagnostic value than roentgenograms in mild acute maxillary sinusitis. The washings are likely to show a small amount of thin purulent serosanguinous secretion before sufficient changes in the mucous membrane and in the secretion have taken place to produce opacity in a film. One other type of case I should like to mention is that of the patient who evacuates completely the contents of the sinus by blowing his nose just prior to the taking of roentgenograms. One would need to examine the plates carefully for possible thickening of the mucous membrane; otherwise, he might declare the condition negative.

Arnott A. Moore, Buffalo, N. Y.: The diagnosis of maxillary sinus disease is so difficult and complicated that any method which aids us in arriving at a solution should be very seriously considered and discussed.

In the discussion of a professional paper, I believe that three things should be attempted: (1) emphasizing of the important points; (2) correction of mistakes, if there are any, and (3) addition of any information on the subject which the discusser is able to give. The value of the oral roentgenogram as an aid in diagnosing antrum conditions has not been fully recognized. A good oral diagnostician may find obscure antrum disease which both the general roentgenographer and the rhinologist have failed to discover. The value of an oral roentgenogram depends largely on the general quality of the same. This includes photographic quality such as clarity, detail, density, angulation and consistency of technic. Dr. Molt has said that many upper roentgenograms are rendered valueless because of foreshortening and the position of the malar shadow. I would add underexposure and overexposure and the use of an insufficiently powerful ray. I am not capable of discussing the value of the McCormick technic in maxillary sinus roentgenography. Dr. Molt has used it for years and therefore his opinion is worth considerably more than mine. Any good technic which is consistently followed as to angulation will disclose a considerable percentage of disease at the base of the antrum. Theoretically, there are four methods of angulation in roentgenographing the base of the antrum orally; namely, straight through, foreshortened downward and foreshortened from anterior to posterior and from posterior to anterior. All methods depend on these angles or a variance of them. Whatever technic is used in making a set of oral roentgenograms should be consistently followed, and if there is any suspicion of antrum disease, the region should be roentgenographed from every conceivable angle. The point which Dr. Molt made about comparison of roentgenograms from the opposite side of the mouth cannot be too strongly emphasized. Any variation of thickness of the walls of opposite antrums should be noted at once, and, if possible, the cause ascertained. Any abnormality in the size of the sinus should be noted. Tooth roots which are resorbed or whose periostial line is broken, also those which project into the antrum or which are out of place, such as root-tips of incompletely extracted teeth, should also be noted. In upper impactions, particularly of third molars, although sometimes of cuspids, often a cystic membrane which frequently projects into the antrum surrounds the tooth. Low grade sinus infection is usually indicated by a grayish fuzz, which shows distinctly in a good oral roentgenogram at the base of the antrum. This is particularly true in edentulous cases. In differentiating an antrum from a cyst in roentgenography, lipiodol should be of great value. In addition to that, it should be an aid in revealing low grade infection in the base; for if two roentgenograms were taken, one with it and one without, and compared, the exact extent of the pathologic process could be determined. I agree that pulpless and pyorrheic teeth in or near the base of the antrum should be regarded with the utmost suspicion. A healthy condition of the antrum is of much more importance to the patient than one or more questionable teeth. Many antrums are opened unnecessarily, and many more are kept under prolonged treatment for no reason. Some of them get better in spite of the treatment, but some of them do not. An antrum puncture should be closed as soon as is consistent with safety, and the patient should be referred to a good rhinologist.

DENTAL FOCI OF INFECTION IN RELATION TO NERVOUS AND MENTAL DISEASE

By E. A. THOMAS, D.D.S., Hastings, Nebr.

ONE of the first to write on the subject of focal infection was Billings, who probably more than any one else centered attention on this subject.

Numerous, almost countless, articles have appeared in the last twenty years. Mountains of teeth and tonsils have been removed, millions of sinuses punctured and curetted, numerous appendixes and gallbladders removed, and even colons and cervices have been sacrificed in an effort to remove a real or suspected focus of infection.

The questions that have been uppermost in our minds during the years of our research have been "Is focal infection simply one of the numerous fads?" and "Is there much of merit in all of these procedures and, if so, how much?"

A brief review of the history of the fads of medicine may give us some insight into these problems. We discover that many fads blossomed for a few years, only to be quickly forgotten when their worthlessness was discovered. About fifty years ago, the ovaries were thought to be, in some indirect and occult way, the source of many nervous affections, especially epilepsy, insanity and psychoneuroses, and surgeons were reporting their cases by the hundreds and claiming marvelous results. It was a curious and sad commentary on this fad that, while a woman had her ovaries removed for these affections, man was fed testicular extract for the same diseases. What a reversal there has been in the handling of these important glands during the past few years! Today, the surgeon is very loath to remove an ovary or a part of it unless there is evidence of disease, and certainly he does not so operate to cure epilepsy and insanity.

About the beginning of this century, a kidney that was movable or floating was supposed to produce a multitude of conditions and symptoms. It is not remarkable, then, that the surgeon of that day began to anchor the wandering kidneys. But results were not permanent. About the time these fadists were silently disappearing from the stage, the rhinologist entered and claimed through removal of the turbinates cures for many diseases which removal of the ovaries and anchoring of the kidneys had failed to afford. This fad was short lived, and was soon gone and forgotten. The rhinologist did not desert the field as the surgeon did after the removal of the ovaries and kidneys, but discovered the tonsils, enlarged, normal and submerged, and proceeded to extirpate millions of these glands.

Epilepsy, beautifully described by the ancients, has had numerous "cures." At one time, a substance (crotalin) made from rattlesnake venom was exploited as a cure for this disease, because some one had a relative living in some western state who was bitten by a rattlesnake and was thus cured of epilepsy. Crotalin is now largely forgotten. Many unfortu-

nate people have holes of various dimensions in their skulls, placed there by well meaning but misguided surgeons who thought that every epileptic whose fits began on one side must of necessity have a focal lesion which should be eliminated by operation. Other surgeons have attacked the abdominal cavity as a site of the etiologic factor in epilepsy. One surgeon discovered an organism in the intestinal tract which has been called *Bacteium cincinnati-cum,* which he claimed was the causative agent in epilepsy. To remove the infection, he began to extirpate the colons, and he actually reported cures based upon his method.

At one time, years ago, the so-called suspension treatment was a favorite method of handling cases of locomotor ataxia, on the theory that stretching the spine was beneficial to the nerves involved. Many famous neurologists gave this method a thorough trial before discarding it. One Parisian surgeon advised a linear craniectomy in order to allow the brain to grow. A fad of recent years which has held an important position in therapeutics relates to the ductless glands. Some physicians would attribute all the ills of man to a disturbance of one, two or all of these structures. About twenty years ago, Abderhalden worked out a series of elaborate tests, the purpose of which was to discover which one of the ductless glands was at fault in a given disease, usually a psychiatric one, and then to prescribe preparations of that gland or of another gland to overcome the deficiency. It was believed that certain cases of dementia praecox and manic depressive insanity were cured by this sort of investigation and subsequent therapy, but at the present time one rarely hears about these experiments.

One of the most common fads at the present time is psychoanalysis, and, in my opinion, it is probably the most dangerous. Countless inexperienced and, from a medical standpoint, uneducated people set themselves up as psychoanalysts and are doing a tremendous amount of harm. To illustrate: In the study of forty nervous pupils, we found one boy who passed a splendid physical examination in every way. There was no hereditary history of mental disorder; on the contrary, his whole family history was one of unusual mental ability. We did some detective work to find the cause of his nervousness and remorse. After getting his confidence, we learned that a so-called psychoanalyst, who had been giving some lectures in our city, had been employed by this boy's parents to analyze him. The boy was so interested that he eavesdropped while the "professor" reported his findings, and heard that the limit of his mental capacity was at the eighth grade of school and that they could not expect intelligent advancement above that; that he should be taken out of school and put to some work where there was little need of mental exertion. After passing the eighth grade, he began to give thought to the "professor's findings and to question his own ability. A poor grade, a foolish action or decision would prove that "the professor knew his stuff"; and finally he began wondering whether his teachers and even people on the street did not notice his defective mentality. Fortunately, this condition was discovered soon enough, and it was proved to him that this pseudoscientist was a fake and not reliable. The boy completed high school, and has had three years in the university, where he has won honors. Yet he still, in some ways, has an inferiority complex, I am told by his mother. At the age of 21, he is on his own resources and this coming year he will teach in one of Nebraska's

schools. This fad of psychoanalysis, like others we have described, will probably die out in a few years, or at most reach its proper level.

We might go on and on reciting many more fads which have arisen in medicine in the last fifty or seventy-five years. But I have recited enough to point out that many things which were thought to be cureall soon came to be properly evaluated.

There is no doubt in my mind that the focal infection theory is in some measure a fad, and particularly so focal infection from dental origin as it is related to mental disorders. It is difficult, however, to separate the real from the false. The number of patients who receive miraculous benefit from the removal of a focus of infection is small. And this is all the more true with the insane, as we have proved in our research in the state hospital, as pointed out in another paper, in which we show that only a little more than 16 per cent of the population of our hospital could be discharged if the entire 48.9 per cent having one or more impactions, apical abscesses, or pyorrhea pockets could be cured. From this number, 16 per cent, must be deducted those patients who are improved and cured, from treatment or spontaneously, without having any dental service rendered them. This percentage is approximately 5. This would leave in our hospital but 11 per cent for whom we could expect a parole or discharge as a result of their having received dental care.

On the other hand, there are many who are certainly better off in a general way for the removal of bad teeth and tonsils, and a cleaning up of foci of infection.

Many enthusiasts who report remarkable cures may find that the psychic element is responsible for a share of the results. The faith and confidence of patients (especially those of lowered mental states and nervous disorders) in their old family physician and dentist is significant, and when both have emphasized the fact that the teeth are the cause of all the trouble, their influence on the mind of the patient is remarkable. This does not argue against the removal of the infected tooth or teeth, but might it not be true that many teeth are sacrificed that are needed by the patient when some form of psychotherapy might be used?

There is no question that the oral cavity, teeth, tonsils and sinuses frequently harbor infections which give rise to symptoms in other parts of the body. But what are the effects of foci of infection on the nervous system? We have endeavored to find a satisfactory answer to this question for the past ten years, and, in each study and report that I have been able to find, there is a lack of some scientific principle involved that questions the answer. There has been a lack of proper controls, or too often the controls have been eliminated entirely, or we see too little unbiased observation and thinking because of the tendency to accept the traditions and thinking of others "whose conclusions may be but a small part of the truth." And in a study of cases, a tendency to find what one started out to find and to be led by tradition is very powerful, and it is difficult to free the mind from beliefs that have been inculcated with the acquiring of knowledge. Research in psychopathology or psychoneurosis requires precision in thinking and observation of the rarest quality. Precise thinking is seldom acquired because methods have become so stereotyped that those who observe do not realize that they are fettered by the bonds of tradition. What are called ob-

servations are often but a mixture of imperfect observations and unwarranted assumptions. While a fact is supposed to be recorded, an opinion is at the same time expressed. An inquirer should keep his mind free from bias and be ready to revise his most cherished beliefs. What is today accepted as axiomatic may be shown tomorrow to be but a part of the truth—a passing fad.

Two cases in which the method of research was nearer the scientific than is usually the case are here reported. What are the effects of foci of infection on the nervous system? Rosenau, who has written many articles on the specificity of the various strains of streptococci, reports an interesting observation. He cites the case of a man suffering from a typical attack of multiple neuritis (a frequently seen disease which is very disabling) which followed so-called influenza occurring three months previous to the time that he was seen by Rosenau, when he was slowly improving, although bedridden and having little power in his hands and feet. The tonsils of this patient appeared normal on the surface, but a moderate amount of pus was expressed from the poles of each. The teeth, which also appeared normal on the surface, on closer examination, revealed marked pyorrhea, with deep pus pockets around several of the molars. Two series of animals were injected with cultures from the tonsils and teeth and lesions of the peripheral nerves occurred in 79 per cent of the injected animals. The streptococci were localized chiefly in the smaller nerves, the larger trunks being free of disease. The involvement of the nerves consisted of hemorrhage and a variable amount of leukocytic infiltration.

In our own research work, we took as our controls a class of patients discharged as cured or dismissed on parole from our institution for one period of two and a second period of five years, before dental service was rendered at the institution. We then endeavored to eliminate all dental foci of infection from the small class of patients received and in the institution the following two and five years, the same psychiatrist passing on both groups as to cures or eligibility to parole, and (as we have reported elsewhere) our discharged patients of the last five years with dental foci removed showed no improvement over those of the previous five years to whom no dental service had been rendered. I cite our own work, which I do not call perfect, only to present this evidence. I might review the work of Kopeloff and Kirby of the New York State Psychiatrist Institution, Ward's Island, who also undertook to see what merit there was in the removal of foci of infection in certain insane patients, especially those who have dementia praecox and manic depressive psychoses. They had two series of cases, one in which all foci of infection were removed, after it had been definitely determined by specialists in the various fields that foci of infection actually existed. In their control group, there were sixty-two patients, forty-one women and twenty-one men. The patients on whom operations were performed numbered fifty-eight, of whom thirty-one were women and twenty-seven men. Certain criteria were established and followed in both groups, and, for obvious reasons, the worst and uncooperative cases were placed in the control group. Their conclusions were as follows:

1. In a series of 120 cases, the removal of foci of infection in fifty-eight instances did not result in a higher percentage of improvement or recovery than was evident in a comparable group of sixty-two

cases in which the foci of infection were not removed.

2. In reviewing the entire group of operated cases showing recovery or improvement, and comparing the original prognosis with the subsequent course, observations demonstrated that, in every patient who recovered, recovery had been forecast before the treatment was started. and no patient recovered for whom a poor prognosis has been given. Furthermore, in only one case did an unexpected improvement occur.

3. A critical study of methods by Cotton for establishing focal infection has proved them to be unsatisfactory for teeth, stomach, lower intestines and cervix.

4. It is desirable to eliminate focal infection when adequately demonstrated in psychotic patients in the same way that one should attempt to alleviate any psycical disorder in a mentally diseased patient. Nevertheless, it has been shown that focal infection is not the etiologic factor in the functional psychoses.[1]

The diseases, especially those of neuropsychiatry, which the focal infection advocates are certain are due to concealed infections are the so-called functional psychoses and the psychoneuroses. A brief outline of the common types of mental diseases may help us here. Those due to organic processes make up about 25 to 30 per cent of the total number and include general paralysis, which is always syphilitic in origin. Those due to diseases such as arteriosclerosis, cerebral thrombosis, brain tumor and cerebral injury are manifestly not due to any focus of infection. Manic depressive insanity, which is characterized by periods of depression or excitement or both, with a tendency toward recurring attacks, make up about 10 to 15 per cent. Dementia praecox, which usually begins before 25 or 30 years of age, exhibits a pronounced tendency toward dementia. The last subdivision is that which we speak of as a toxic infection or toxic-exhaustive psychosis, and which occur from such toxemias as alcohol, cocain and lead poisoning and those arising during and after infections such as typhoid, pneumonia, erysipelas, malaria and influenza.

One seldom sees a spectacular result from the elimination of any one of the ordinary focal infections in nervous or mental disorders any more than in other conditions. While the rôle of focal infection in the production of nervous and mental diseases is a minor one, undoubtedly the presence of pus anywhere in the body will act as a hindrance to recovery. Therefore, I believe all real foci of infection should be removed, not only in those who are ill and present themselves for examination, but also in the individuals who seek periodic health inspection for prevention.

1. Kopeloff, N., and Kirby, G. H.: Am. J. Psychiat., 3:149 (Oct.) 1923.

L'ODONTOTECHNIE: THE FIRST DENTAL DIDACTIC POEM

By LAWRENCE PARMLY BROWN, D.D.S., Peekskill, N. Y.

IN the numerous didactic poems on various medical subjects that have appeared in the course of the ages, there is very little concerning the teeth.

Three recipes for medicinal dentifrices are found among the fragments of Servilius Damocrates (first century, A. D.), and "De Medicina Praeceptor" of Serenus Sammonicus (third century), contains three interesting dental sections. Still more interesting are the six tooth-texts in the celebrated "Regimen Sanitatis Salernitanum" (twelfth century), with the Latin commentary of Arnaldus de Villa Nova and the old English translations of Paynell, Harrington and Holland. Camillo Brunori has a curious stanza on the teeth in his "Il Medico Poeta"; but they have only passing mention in the two later medical poems of note, John Armstrong's "Art of Preserving Health" and E. L. Geffroy's Latin "Hygiene" (eighteenth century).

The first didactic poem devoted wholly to the teeth and dentistry is Julien Marmont's "L'Odontotechnie, ou l'Art du Dentiste, Poëme didactique et descriptif, en Quatre Chants, Dédié aux Dames." (Paris, 1825). It has never been translated, or even noticed by English writers except in dental bibliographies; and is but little known in France at the present time.

In the year that it was published, a long rhymed review of it appeared entitled "Épitre à M. Marmont . . . par, M. . . ." (edited by A. Delmond, and perhaps written by him). Most of this review is put in the mouth of a suppositious critic who is inspired by envy, and is very unjust and satirical; while the writer of the "Épitre" pretends to be an opponent of this critic and a sincere admirer of Marmont's verses. Both "L'Odontotechnie" and the "Épitre" are now extremely scarce. The former probably suggested a satirical passage in Chapter VII of Murger's "Scènes de la Vie de Bohème" (1848), in which Rudolph says he is earning a little money by writing a dental didactic poem for a celebrated dentist; but André-Bonnet speaks favorably of Marmont's poem and quotes four long passages ("Histoire Générale de la Chirurgie-Dentaire," 1910).

In another work by Marmont, his "L'Esthiomenie," in prose (1830, etc.), we have many particulars of his life. He was the son of an eminent physician and at first practiced medicine. Later, he became a dentist, in 1800, and for thirty years he was one of the leading dentists of Paris. He had the patronage of the great Napoleon and included the Empress Josephine among his patients. He originated several ingenious dental devices and processes, among the latter being his "esthiomenie," a process of applying a hot chemical vapor to dental cavities, by which he claimed to arrest the progress of caries. In 1831, he left Paris, practicing in several other continental cities, until his death (after 1850). From another source, we learn that he had been

unfortunate in his marriage and met with financial reverses in Paris. During his half century in dentistry, he published many editions of a booklet entitled "Bol d'Armènie" (advertising his elixir for diseases of the teeth and gums, and for toothache.

In the *Avant-propos* to "L'Odontotechnie," the author tells us that he had written other works, in prose and verse, and was induced to undertake his dental poem by some literary friends with whom he had been discussing the merits of the descriptive poet Delille. A large bet was made on the success or failure of the effort, and Marmont was warned in jest that his Muse ran the risk of soon being *sur les dents* ("on the teeth," a phrase like "biting the dust").

The four *chants* or cantos of the dental poem proper, in rhymed couplets, run to about thirteen hundred verses in the usual twelve-syllable form of the French descriptive and didactic poets, and are preceded by a long *Monologue Dramatique* and an *Épitre Dédicatoire aux Dames* but little shorter.

"L'Odontotechnie" is of considerable historic interest, and includes much classic and medieval material relating to the teeth, most of which appears to have been derived from J. R. Duval's "Conseils des Poëtes Anciens sur la Conservation des Dents" and his "Dentiste de la Jeunesse." Being didactic, the dental poem proper is naturally more or less prosaic; but it contains some passages that are not unpoetical, and hardly a word to offend the most prudish taste—thus justifying its epigraph, *Quae legat ipsa Lycoris* ("Such as Lycoris herself may read," from Vergil, *Bucolica,* X, 1). The author is sometimes strikingly original, though usually then at his worst poetically. He has little of orderly plan, is sometimes too diffuse and frequently wanders away from his subject. His notes, forming a long prose supplement to his verses, are not very illuminating and give but few references to authorities.

A selection of the most interesting dental passages in the dental poem proper will be presented in the following short review, rather close line-for-line translations, necessarily prosaic, being employed as more suitable for our purpose than longer paraphrases with the rhythm and rhyme of the original.

L'ODONTOTECHNIE: CHANT I

The invocation is to Venus, after the manner of Lucretius to the same goddess at the beginning of his "De Rerum Natura." Then Marmont pays his respects to some of his predecessors in didactic poetry, and continues:

Everyone knows that Aesculapius was a son of Apollo:
Why then, be afraid today, in the sacred vale,
To extoll in verse an art born of surgery?
What! Cannot I, as well as my predecessors,
Embellish my subject, and adorn it with flowers?
I shall venture, at least, for as Horace has said,
Success sometimes has crowned audacity.[1]

. . . . . .

But first, of my art let us trace the origin:
Aesculapius once, to the dwellers of Aegina,
Taught, the first one, the art of extracting teeth,
And of whitening the ivory clouded by the years.[2]

1. Horace (*Epistolae,* III, 1, v. 166), merely speaks of the Roman writer who "dares successfully (feliciter audet)"; but epigrams suggested by this expression were current before Marmont's time.

2. But according to Cicero (*De Natura Deorum,* III, 22, Sec. 57), the third Aesculapius, whose tomb was shown in Arcadia, was said to have discovered the art of purging the bowels and of drawing teeth *(primus purgationem alvi dentisque evulsionem, ut ferunt, invenit).* An erroneous reading, *"purgationem albi,"* seems to have suggested Marmont's "Whitening the ivory . . ."

The next section is in laudation of Fauchard; after which the author tells us that the mouth has often been compared to the rose, and that just as a flower has need of cultivation, so is it necessary to care for the mouth and especially the teeth. He continues:

If you neglect your teeth, a yellowish rust
Accumulates on them, and soon stains their alabaster;
Your breath is fetid, and this corroding poison
Ends by causing you to have a pitiless pain,
Which increases, which irritates. Infected mouths
Show at length only two rows of black, decayed teeth.
What is more revolting than a mouth so filthy?
Unhappy one! I see you tremble and shudder:
But there is still time; make haste and run
To a dentist who is skilful, whose light hand
Will shortly relieve you of a tartar corrosive.

Wives are warned that they can hardly hope to hold the love of their husbands without a laughing mouth and a sweet breath; and, to emphasize this warning, a passably poetic episode is introduced (of the author's own invention, as he tells us in a Note):

Of a woman at the same time young, pretty and amiable,
I wish to tell you the deplorable story:
. . . . . .
Altogether she was charming, and her young face
Had never known the use of a deceiving cosmestic.
. . . . . .
A husband presents himself; he pleases; in a short time
The altar of Hymen has received their vows,
But proud of their charms which Nature had given her,
Zoe neglected too much the care of her teeth,
And never brushed them with a little labor,
Nor made any effort to preserve their enamel.
When her husband dared to blame her neglect,
Zoe replied to him in a tone of arrogance,
"Of my beauty, Monsieur, you would take too much care;
Art was not made for me: I have no need of it."
. . . . . .
And of this vanity, what was the result?
Her beauty and her youthfulness lost their luster;
Through her lack of care her teeth were decayed
To a point where pestiferous vapors came from them;
And soon, disregarding her prayers and her tears,
The husband of Zoe sought refuge in flight.
. . . . . .

Next come some verses on the clavichord or piano (for the author rather loosely uses both words for the same instrument), with the teeth compared to the keyboard, as often has been done by other writers before and since.

Marmont then refers to Fauchard and Jourdain[3] as warning that heat and cold and certain foods are injurious to the teeth, and that thorough mastication is necessary. Jourdain alone[4] is cited for the opinion that sugar and bonbons are especially injurious to children's teeth;

For their corrosive juice, collecting on the teeth,
Will uproot them before the appointed time.
Who kisses a child with a gap-toothed mouth?
As for me, I think I see a withered flower,
Which loses in the springtime its perfume and color.
Parents, give heed to me: avoid this misfortune!

Fauchard is then cited for the opinion that tobacco smoking is bad for the teeth,

3. Fauchard: Le Chirurgien Dentiste (1724), Chap. IV., Jourdain: Nouveau Elemens d'Odontalgie (1728), Chaps. I and III.

4. Jourdain, Chap. VI, 86; following Fauchard, Chap. IV. In this part of the poem, Marmont seems to recognize Jourdain as an authority not inferior to Fauchard; but, in several other passages, we find a lively appreciation of the pre-eminence of Fauchard, of whom our author speaks in a note as "sans doute le premier des dentistes" (p. 149). Again, once in the poem itself, dentists are called "children of Fauchard" (Chant IV, p. 64).

but that the use of snuff is good for them as a preventive against dental diseases[5]; and the reader is warned against cheap dentifrices and acids for whitening the teeth. Then we have:

Eloquent orators, by whom France is honored,
Know the importance of caring for a set of teeth;
For words, if they are not pronounced clearly,
Very far from being a pleasure, become a torment.

. . . . . .

We know that Saint Jerome, in the decline of his life,
Learning the guttural language of the Hebrews,
To better pronounce its harsh and sibilant sounds,
After vain efforts, had his teeth filed down;
Then his voice became clearer and more sonorous.[6]

. . . . . .

A too frequent use of the steel file
Will end by destroying the enamel of your teeth,
That precious varnish; the brush too active
Can also sometimes detach the gum
And loosen the teeth which one wishes to whiten.[7]

Moreover, if the teeth be uneven, though white,
They detract from the carmine of loveliest lips;
For in connection with whiteness, it is regularity
That constitutes the greatest beauty of the teeth.
Of what advantage indeed are teeth like ivory
If the eyes perceive in the depths of the jaw,
Especially at the front, in a frightful disorder,
Bones which one might think are fighting among themselves,
Often with some point distending the cheek
Of a face that seems then to make a grimace.
Such was the state of that Geoffroi of the Great Tooth,
Of whom the aspect was sinister and repulsive.
The file, in a like case, repairing the disorder,
On your teeth can press itself and bite.[8]

The close of Chant I includes the following:

A poet has said: There is not one tooth
Equalled in value by the most beautiful diamond.[9]
Yes: the whitest pearls from the Gulf of Ormus,
Please and enchant us less than a beautiful set of teeth.
See Doris laugh: on the enamel of her teeth
Love seems to sharpen his most ardent arrows,
Which he throws into our hearts with a hand ever sure.

. . . . . .

Nothing is more enchanting than a denture white as ivory,

5. Fauchard, Chap. IV. Jourdain merely notices that tobacco smoke stains the teeth, Chap. VI, Sec. 6.

6. Marmont's authority for this legend of Jerome is doubtless Duval, who says in "Le Dentiste de la Jeunesse," Chap. II (1817, p. 32): "Si pour parler le langue juive avec plus de grâce, S. Jérôme s'est fait limer des dents."

7. Here again our author follows Duval, who says that if the toothbrush is directed across the teeth, from right to left, "it has a tendency to detach the conical points of the gums, which separate the teeth"; wherefore he advises that the teeth be brushed in the direction of their length, "because then the bristles of the brush act like so many little toothpicks that glide between the teeth and remove every trace of slime" *(Op. cit.,* pp. 104-105; cf. Atkinson's trans. p. 51). This advice seems very modern, but it was given more than a century and a quarter ago.

8. Duval is followed again; in fact, what he says of Geoffroi of the Great Tooth seems to be all that Marmont knew of this hero. Speaking of the necessity for filing off any teeth that are longer than the others, Duval says that they give a young person a disagreeable appearance and that great care should be taken to render them even, "lest the proverbial expression should be applied to him, 'C'est Geoffroi a la grand-dent.'" *(Op. cit.* Chap. IV, p. 94; Atkinson's, p. 45.) The story of this Geoffroi or Geoffroy, who is described with a cuspid tooth like the tusk of a boar, is part of an old French historical romance, "Histoire de Melusine."

9. A paraphrase of Cervantes, "Don Quixote," III, 18.

True keyboard of love, and a dazzling treasure.

. . . . . .

L'ODONTOTECHNIE: CHANT II

This canto begins with a long presentation of the central story of the celebrated romance of Huon of Bordeaux; but, in certain details, Marmont gives us some remarkable variations from the story as otherwise known. According to the usual version, Huon kills Charlemagne's favorite son, Charlot, in self-defense, and obtains a promise of pardon from the emperor only on condition of proceeding to the court of the Saracen Admiral Gaudys at Babylon, where he must cut off the head of the greatest lord that sits at table with the Admiral, kiss the latter's daughter three times, and obtain a handful of the father's white beard and four of his "great teeth" as tribute for Charlemagne. With the aid of the fairy King Oberon, and after many heroic adventures, Huon not only accomplishes all this, but also slays the Admiral and wins the love of the daughter, whom he takes to France, where he finally succeeds in delivering the teeth and beard to Charlemagne.

Marmont considers that this tooth-drawing adventure warrants him in classing Huon as a dentist:

Who does not know the marvelous history of Huon?
It adds to the glory of the art that I celebrate:
The dentists are proud, and no doubt with reason,
To count in their ranks a lord such as Huon.

This is followed by the author's version of the story above outlined (but without any reference to the Admiral's daughter), in the course of which a jealous minister to Charlemagne (instead of the emperor himself) tells Huon that he must draw three (instead of four) teeth from the jaw of "the Sultan":

In the midst of the court, in the name of your master,
Demand as a tribute three stumps from this traitor;
You must draw them yourself, and without hesitation.

So Huon takes a pair of forceps in his hand instead of his sword, and proceeds to Bagdad (but he did great deeds with his sword on the way thither, according to the legend). At the court of "the Sultan" (with details omitted), he

Drew from the miscreant three great molar teeth.

. . . . . .

It is because of this deed that the sons of Huon
Have borne an escutcheon with three teeth in a blue field.

The last statement seems to have originated with Marmont, and in all probability three teeth were substituted for four so that they could be conceived as placed on the escutcheon in the manner of the well-known fleurs-de-lys and other armorial groups of three.[10]

According to the poem, dentistry was not only honored by Huon as a tooth-drawer, but also by the fact that the celebrated French tragedian, Talma, had been engaged "in the art of Machaon" when a young man.[11]

10. In fact, three molar teeth are thus placed on the escutcheon of a Baron de Saint Laurent (1763-1810), a crude engraving of which is reproduced by Dagen in La Semaine Dentaire, Vol. VIII, No. 39, Supplement.

11. Here, p. 34, and again on p. 71, "the Art of Machaon" is dentistry as a branch of surgery; whereas, on p. 42 it is surgery proper. In his "Epitre Dédicatoire," Marmont has "disciples of Machaon," apparently for dentists. In Homer's "Iliad," Machaon and Podaleirius are sons of Aesculapius who practice the healing art. According to Eustachius (Iliad XIII, 515), it was said by some that Machaon practiced only surgery, while Podaleirius only treated diseases.

After a long eulogy of Talma, the poem continues:

You who devote yourselves to dentistry
Must unite the theory of it with the practice;
Study your art and labor constantly,
And do not limit yourself to the filling of teeth.
Follow the example of Maggiolo, in his researches
Every day discovering new marvels:
In his laboratory with his heating utensils,
His spirit lighted itself at the fire of his furnace;
Learned in surgery as in medicine,
Like his teeth his glory has taken root.[12]

After a few more verses regarding the necessity for study, we have an account of the celebrated golden tooth of the Silesian boy (16th century), one of the greatest impostures in history, as the tooth was really a gold shell like a modern crown.

Then comes a section on artificial teeth of ivory on metal plates held in place by springs;

We sometimes make them of porcelain paste.
. . . . . .
But we use also the natural teeth,
Which I know how to prepare in a new fashion,
By letting them plunge into boiling water.
. . . . . .
There happens often some mistake exasperating:
For a single tooth, two have been taken from you.

An episode is then introduced from Calderon de la Barca[13]; but Marmont's version is so diffuse and differs so widely from the original that an outline of the latter will be presented here. A man (Marmont says "a certain officer") had an aching molar, and a barber came to draw it ("on the day of a fair," according to Marmont, for the sake of a rhyme). The barber asked which tooth was aching, and the man answered, "The penultimate" (Marmon adds, "on the left side"); but as the barber was not well informed on penultimates, he pulled out the last one. The man remonstrated with "bloody outcries," saying that the aching tooth had not been removed, and after explaining what "penultimate" meant, he said he had come to have "the next to the last tooth" removed. So the barber proceeded to pull the tooth that was then the penultimate, thus depriving the man of another sound molar, and leaving the aching one still in place; all because plain language had not been used.

Marmont utilizes this episode as an introduction to a few verses advertising a mouth mirror which he invented, here described as an aid to the dentist in avoiding the danger of extracting a wrong tooth. And then he says:

Dentists, beware, without severe study,
An operator is only a common artesan.

12. "De Même que ses dents sa gloire a pris racine." This verse, one of Marmont's most original and worst, invites the following attack of the "Épitre" of Delmond:

Kindly tell me, monsieur the admirer,
If from some furnace borrowing the fire,
The author has not even lighted his own brain.
As for me, I think he has burned his spirit,
Did any one ever see glory with a root?

Maggiolo was an Italian dentist who practiced at Nancy in southern France at the beginning of the nineteenth century. His laboratory researches seem to have been confined to dental metallurgy in connection with the construction of gold base-plates, bands, clasps, pivots, bridges and even artificial roots for pivot teeth. See his "Manual de l'Art du Dentiste," Nancy 1807 and 1809. The former edition is "par M. Jourdain, Docteur-Medecin de la Faculté de Montpelier, & M. Maggiolo, Chirurgien-Dentiste de la Faculté de Génes, de Pavie," etc., while the latter is accredited (on the table-page) solely to Maggiolo.

13. As Marmont tells us in a note, p. 125, where he adds that he regrets not having the works of that famous Spanish dramatist, as otherwise he would cite the original of this "historiette." It is related by a *gracioso* or clown in Calderon's comedy "Los dos Amantes del Cielo," II. 6.

It is much for us to cure, but needful still
To know how to make progress with real inventions.
Try to unite the agreeable with the useful;
It is the advice of Horace.[14]

. . . . . .

To the tears, to the sighs, to the cries of pain,
You must close your heart and harden your soul.[15]
Doris offers herself with regret to your vigorous art;
Be deaf to her cries when the forceps bite;
Without flinching seize the tooth that torments her;
Go even to the root of it, to extirpate the evil.
Doris, no doubt, in that fatal moment,
Will pour out some tears from her beautiful eyes,
And you must console her, appeasing her fears;
Then on your breast she will throw herself, groaning,
But admiring the talent of a skilful dentist.

. . . . . .

When the enamel of a tooth begins to get black,
Prudently to the remedy you must have recourse;
If a few teeth chance to become decayed,
Their sisters with the same disease will soon be infected.

. . . . . .

The necessity for imperturbability, when performing such operations as lancing the gums, is illustrated by a long story of a young surgeon whose sympathy and nervousness caused the death of his enamorata when he bled her for an apoplexy; and the canto closes with some verses on the old warrior who is insensible to the cries of the wounded while the battle rages but afterward opens his heart to pity. All this, however, is quite foreign to dentistry.

14. Horace (*Ars Poetica*, 343) says that a writer will gain every vote "who mingles the useful and the pleasing *(qui miscuit utile dulci)*," which is the source of many French expressions relating to the literary mingling or joining of the useful and the agreeable.

15. In accordance with Celsus *"De Medicina," VII, praef.*

L'ODONTOTECHNIE: CHANT III

Again, at the beginning of this canto, we find a long section that has no relation to the subject of the poem. Then comes part of the very obscure classic story of Cadmus and the dragon's teeth that were sown by him and sprang up as armed men; and Marmont claims that Phoenician hero as the inventor of dentistry. This is one of the author's most original concepts, which seems to have made a special appeal to him, the frontispiece of "L'Odontotechnie" being an engraving of Cadmus holding aloft a tooth of the dragon, which lies dead at his feet, with the following couplet from the poem (of course in French) beneath the engraving:

With the teeth of a proud dragon Cadmus sowed the earth,
And invented first the science of dentistry.

In support of his claim, Marmont is able to give only the following bizarre interpretation of the warriors who sprang from the teeth:

These brigands whom one sees fighting and dying,
They are the envious whose implacable hatred
Has pursued true talent in all times;
They are the prejudiced, reborn incessantly;
They are the doctors unskilled, and the old partisans
Of methods too often false and routine.
I see the abuses of these great molars,
Which one cannot extract without long efforts.

That is all of the interpretation; but the author insists that it is the true one, and calls dentists "disciples of Cadmus" (p. 53) and "children of Cadmus" (p. 64).

The only other passage relating to the teeth in all this canto includes the following verses:

The poet, afflicted with a cruel pain,
Sees his Muse rebel at his greatest efforts:
He implores the gods, but the gods remain deaf.

At last his pain has recourse to your talents.

. . . . . .

Soon from his torments delivered by your aid,
He is able to speak, to sing, and to rhyme at ease,
Without fearing the horrors of a long insomnia,
To you the public owes the fruits of his genius;
You may well be proud of his noble works;
With him do you fly to immortality.

L'ODONTOTECHNIE: CHANT IV

Among the first forty verses of this canto, only four relate directly to the subject of the poem, and in these we probably have a thinly veiled advertisement of Marmont's Bol d'Arménie.

We are advised next that modesty should always be joined to merit, but that nevertheless:

It is well to attract the public attention,
To place a metallic tooth on your door,
While a copper plate indicates your name;
And even that enormous tooth of iron or brass,
Which custom has consecrated a very long time,
Is understood by all and is an advantage.
But some, to attract the notice of those that pass,
Decorate their houses with long rows of teeth,
Or in glass cases place images of wax,
Some rude masks that seem always to laugh:
Leave these vile methods to all those charlatans
Who seek at any price to attract patients.

. . . . . .

But of all the methods employed in Paris,
One of the most singular, at least in my opinion,
Is that of setting up for a burlesque sign,
A heavy jaw, enormous, gigantic,
Which by a very ingenious mechanism,
Goes all day long opening and closing.

. . . . . .

But from such a device I beg to be excused.
I follow the example of the illustrious Fauchard:
He would never have resorted to such methods.

A little further on we have a long account of the charlatan dentist of the time:

Perched on a rude stage when appealing to the ignorant
In praise of the surprising effects of his balsam;
Two chaplets of teeth hung to his belt
Compose the ornament of this impudent brother.

. . . . . .

"O! yes, indeed!" says he to the stupified crowd,
"I have traveled through Egypt and India and Arabia,
To look for the treasures now offered to your regard.

. . . . . .

I have seen the whole army of the Great Mogul perish,
To gain a remedy as sure as it is gentle.
The price is not great: it costs but five sous.
If you deprive yourselves of it—no reproach is intended—
It must be that there are not five sous in your pockets.
I pull out your teeth without making you suffer:
The balsam which I sell is an essence unique;
It also cures headaches, and even the colic."
Still our man continues, and in the same tone
Swears that he cured the proud King of Siam;
And forthwith, of this ruler and of his entire court,
Is exposed to your eyes the rude portrait
On a huge canvas. . . .

Then we have half a dozen pages (68-73) of diffuse and loosely connected verses, from which the following are selected as of most interest:

What is a good meal without a good set of teeth?

. . . . . .

One digests badly what one has chewed badly.

. . . . . .

Therefore preserve your teeth, if only for health.

. . . . . .

Should I not recommend to the belles of my time
Both the care of their mouths and the care of their teeth?
It was thus formerly, on this dry subject,

That the ingenious Ovid spoke to the fair sex.[16]

. . . . . .

I hate that apprentice in the art of Machaon
Who deprives you of a tooth without rhyme or reason.

. . . . . .

A simple remedy sometimes suffices
To soothe the pain of a murderous tooth.
In your work let humanity always preside:
Be not greedy of a degrading fee.

. . . . . .

I curse with good cause the fatal instrument,
Which, seizing its prey both hard and refractory,
To cure me of a slight pain, oftentimes
Ravishes a precious furnishing from my mouth,
When by means more gentle and dependable,
It still could have served me till my death.

. . . . . .

Turning his attention to transplantation as practiced before his time, Marmont says that the purchasing of teeth of the poor to be placed in the mouths of the rich was a shameful and atrocious abuse, which dishonored both parties to the transaction. Two advertising passages follow: the first relating to the author's method of preparing (purifying) natural teeth for artificial dentures by plunging them into boiling water (of which he spoke in Chant II), while the second relates to his "Esthioménie":

Without inflicting the burning wound of the iron,
I indeed can defend the teeth from caries,
Which formerly too often consumed them quickly,
In connection with the cruel rubbing of the file.
This new process, the fruit of my industry,
Is known by the name of L'Esthioménie.[17]

For you have promised us that it will always cure.
You press the piston: in the same moment
The evil evaporates—or at least the fumes!

The final dental topic in the poem relates to the ancient and widespread belief that to dream of having a tooth extracted foretells the death of a relative or friend. In connection with this belief, Marmont gives an expanded and altered version of a story of Vespasian found in Suetonius ("Vitae Duodecim Caesarum," Vesp. 5). The Roman biographer tells us that Vespasian dreamed in Achaia (in Greece, 67 A.D.) that the beginning of good fortune for himself and his family would come as soon as Nero had a tooth taken out; "and the next day it came to pass that a physician walked into the hall and showed him a tooth which he (the physician) had just taken out (of Nero's mouth)." Of course, the Emperor's teeth were recognized as symbols of his biting or fighting power; and when Vespasian sees the extracted tooth, Marmont makes him cry:

I am master now and Caesar is no longer anything.

But our author quite gratuitously says that the tooth was a molar and that the physician who extracted it was a Greek, who thrust it into Vespasian's hand.

O Rome, your destiny depended on a tooth!
A pair of forceps disposed of the empire's scepter!
Suetonius is witness for the story you have read,
I point out the authority, the reader can consult it:
I have translated word for word, without adding anything.

The astonishing statement in the last verse is explained by Marmont in a note as made in accordance with his conception of poetic license, and not to be taken literally.

16. In his *"Ars Amatoria,"* and his *"Remedia Amoris."*

17. On this, the writer of the "Epitre" says to Marmont:

Then falling without doubt into too much modesty,
You have said almost nothing about L'Esthiomonie.

The epilogue to "L'Odontotechnie" begins as follows:

It is thus that I dare, disciples of Delille,
To make fertile a subject that appeared to be sterile,
O Muse! this is enough. Let us make an end to our song.
All bathed in sweat, Pegasus is on his teeth;
He rears and frets under my weakening hand,
And loses his failing vigor in vain efforts.
. . . . . .

The "disciples of Delille" are the author's friends with whom he made the bet on the success or failure of the poem, and who warned him that his Muse ran the risk of soon being "on the teeth." We have no evidence as to how the bet was decided.

DENTISTRY AMONG THE LEPERS

By VICTOR VIGNES, D.D.S., New Orleans, La.

THE United States Government maintains at Carville, La., facing the Mississippi river, Marine Hospital No. 66. This institution is conducted solely for the care of lepers and is considered one of the best hospitals of its kind in the world.

The treatment given the patients is splendid in every respect and everything is done to allay their sufferings and to relieve, if only in part, the mental anguish caused by their forced separation from the rest of the world.

Years of research has made it possible to cure effectively some cases and to render others harmless, so that they can return to society without danger of spreading the infection.

Dental ills add greatly to the sufferings of these unfortunates and manifest themselves in a variety of forms; but up to the year 1922, no really scientific dentistry was done for these patients. Occasionally, dentists would go to the hospital for the purpose of extracting teeth; and those who were so kind did not care to have it known to their patients.

Since 1922, dentistry has been regarded as an important branch of the service in this hospital, and we believe that American Army Dental Surgeon Bernard M. Prejean, has the unique distinction and honor of being the only full-time dental surgeon in a leprosarium.

Dr. Prejean is a graduate of Loyola University of the South, at New Orleans, La., of the year 1918. Two weeks after his graduation, he joined the army and was soon commissioned as a first lieutenant in the dental corps. After the war, he went into private practice; but, in 1922, he decided to reenter the government service and then began his meteoric career as dental surgeon in the leprosarium.

The dental service is complete in every sense. There is a well appointed two-chair clinic and mechanical laboratory. A fully equipped X-ray laboratory is also at the disposal of Dr. Prejean for his work.

The dental work has been systematized and carefully planned to meet the needs of the patients. Several of the inmates

BERNARD M. PREJEAN, D.D.S., Carville, La.

have been trained as assistants in the clinic and in the laboratory.

The treatment of pyorrhea alveolaris and leprous oral ulcers receive the greatest attention, and next in order are extractions, denture construction, root canal work, crowns and bridgework, fillings and prophylaxis.

Dr. Prejean is doing a work never done before. His findings are original and

are now a matter of record with the government. He has found that the treatment of oral lesions have greatly reduced eye conditions, gastritis and other complications of leprosy. He has demonstrated the value of mercurochrome in the treatment of these oral lesions.

The work on pyorrhea has shown that it is a common complication of the nodular type rather than the anesthetic type of leprosy. Records show that, when this work was started, 70 per cent were affected with pyorrhea, and now the percentage has been reduced to 20.

Denture construction presents many difficulties owing to the peculiar resorption of the process and bone; but Dr. Prejean's untiring efforts have made it possible for 90 per cent of the denture patients to get along in comfort.

This young man deserves much praise from his profession for his courageous and unselfish devotion to these unfortunate people; this, besides the share that is due him for his original findings and his researches in the study of this dreaded malady.

Dr. Prejean has made various reports and observations from his experience in the leprosarium, some of which follow:

PYORRHEA ALVEOLARIS IN LEPROSY

In the first report submitted relative to the percentage of pyorrhea alveolaris in leprosy, I stated that it was then 70 per cent. A year later, that percentage had decreased to 50 per cent. At the present time, only 18 per cent of the patients of this hospital have periodontoclasia.

In discussing the relative severity of cases of pyorrhea alveolaris in the U. S. Marine hospital, the classification of the disease in three stages suggests itself: (1) first, or congestive, stage; (2) second, or inflammatory stage; (3) third, or purulent stage.

In the nodular type of lepers, it has been observed that the congested gums, especially lingually of front upper incisors, are highly sensitive and bleed on the slightest touch. This condition rarely occurs in the region of bicuspids and molars. It is my opinion that, in this stage of the disease, lepers having the nodular type of disease are more affected than the other type, which is due presumably to the toxic effects of leprosy. It has also been observed that the second stage is more prevalent and susceptible to infection in nodular leprosy than in other types of the disease and likewise in the third stage of pyorrhea alveolaris.

CONCLUSIONS

1. The percentage of pyorrhea alveolaris in this hospital has decreased to a considerable amount and, by continuous dental treatment, the percentage has become lower each year.

2. Pyorrhea alveolaris in lepers in this hospital has the same clinical symptoms as in nonlepers, with the exception that I have discovered lesions in the nodular type of leprosy that were leprous in nature.

3. The etiology of pyorrhea alveolaris as determined in the National Leprosarium is the same as elsewhere.

4. In leprosy as in other diseases, the more advanced the systemic condition, the lower the vitality and resistance of tissues to infection.

MERCUROCHROME: ITS DENTAL USE IN THE NATIONAL LEPROSARIUM

Mercurochrome was first experimented with and tried by Hugh Hampton Young and associates in the James Buchanan Brady Institute of the John Hopkins Hospital, who were looking for

a urinary antiseptic that would combine the following properties: (1) ready penetration of the tissues; (2) lack of irritation; (3) germicidal activity; (4) solubility in water and stability of the solution; (5) freedom from precipitation in urine; (6) sufficiently low toxicity to avoid systemic effects from the small amount of the drug that may be used.

Mercurochrome is prepared from greenish crystals dissolved in freshly distilled water to the desired percentage. It contains 24 per cent of mercury, and is incompatible with acids, with the salts of most alkaloids and with local antiseptics. The aqueous solution stains the mucous membrane red wherever applied, owing to the fluorescin which is contained in the drug.

Lester Cahn reports the cure of a stubborn case of Vincent's infection by the use of mercurochrome, given in a 5 per cent solution administered locally, and a 2 per cent solution as a mouthwash.

The local use of mercurochrome in the treatment of different oral conditions of lepers has been most efficacious. The drug is used as follows: 1. Combined with Black's mixture in the treatment of oral leprous ulcers. 2. In the treatment of leprous gingivitis and gum hypertrophy. 3. In the treatment of leprous stomatitis. 4. In irrigating pyorrhea pockets. 5. In the relief of edentulous mouths when irritated by dentures. 6. Combined with Black's mixture, to hasten granulation. 7. To relieve postoperative pain after extraction.

Treatment of oral ulcers by mercurochrome 5 per cent and Black's mixture.—Jan. 24, 1927, a report was submitted to the U. S. Public Health Service Bureau for publication in the Marine Hospital Notes for Dental Officers entitled: "Ulcers found in the mouths of 372 patients in the National Leprosarium." It was reported that the percentage of leprous ulcers in the mouth was 41.33 per cent. A case was reported as follows: "The patient started treatment, May 21, 1926. A local application of a 5 per cent solution of mercurochrome was applied to the ulcer, this treatment being continued daily until May 29, 1926. Treatment was renewed July 30, 1926, at which time ulcers began to heal. A mouthwash was prescribed as follows: mercurochrome, 2 per cent, one tablespoonful in a glass of water every three hours. After several treatments, the mouth was relieved of all soreness. August 10, the ulcers had practically healed. This patient often spoke of the confidence he had in this treatment, and judging from his promptness in keeping his appointments, I was convinced that he was sincere in his statements.

A month later, the patient had a severe reaction, having leprous fever, and the ulcers had broken out larger than ever. From 10 to 15 drops of Black's mixture was added to 7 ounces of a 5 per cent mercurochrome solution. The formula was: phenol, 1 part, oil of cassia, 2 parts and wintergreen, 3 parts. Black's mixture was formerly used in the treatment of putrescent root canals. Eight daily treatments were administered and the ulcer disappeared. Up to the present day, no recurrence of the ulcer or any other ulcer has been observed in the patient's mouth.

In the treatment of leprous gingivitis and gum hypertrophy, at the first sitting, the necks of teeth are thoroughly scaled and lesions are swabbed with a 5 per cent solution of mercurochrome until all soreness subsides. In the course of time, as the general condition improves and the lesions disappear (in some the

lesions disappear rapidly), the 2 per cent solution, diluted for a mouthwash, is prescribed for home use. After the pyorrhea pockets have been curetted, mercurochrome, in a 5 per cent solution, is used to irrigate the pockets.

For painful osteitis after extraction, irrigation with a 5 per cent solution of mercurochrome is used.

For the relief of pain and soreness in patients wearing dentures, mercurochrome is used to advantage in a 5 per cent solution. Mercurochrome and Black's mixture is very useful for hastening granulation, one application being sufficient to stimulate the tissues.

CONCLUSIONS

1. The local application of mercurochrome is not a specific in the healing of mouth lesions.

2. Mercurochrome, because it is neither escharotic nor irritating to the tissues, is a most valuable asset in dental treatment of lepers.

3. It is believed that the healing and repair of mouth lesions in lepers depends largely on the systemic progress of the disease (leprosy) itself.

BONE ABSORPTION IN LEPROSY

Leprous absorption of the alveolar process is a condition involving the anterior part of the maxilla, very rarely occurring in the mandible, ranging from cuspid to cuspid. All the cases reported in this hospital were found in the mixed type of leprosy.

REPORT OF A CASE

The patient was first examined, April 16, 1924. The clinical symptoms and roentgen-ray examination showed extensive absorption of the alveolar process in the region of the six anterior teeth. There was no history of pyorrhea. Two large leprous ulcers were located at the junction of the hard and soft palate. Owing to infection, the following teeth were removed: upper first and second bicuspids; upper first and second molars; upper left lateral incisor and cuspid; lower second and third molars.

In a short time, the leprous oral ulcers entirely disappeared, and full dentures were constructed.

CASE REPORTS

By FREDERICK A. BRICKER, D.D.S., Hollywood, Calif.

CASE 1.—*History.*—A draughtsman, married, aged 38, was anemic and underweight and complained of being tired. He was not rested even after a night's sleep. He suffered from constipation.

Examination.—The blood count was: red cells, 3,600,000; white cells, 12,000; hemoglobin, 60 per cent. The blood pressure was 135. Urinalysis was negative. The patient weighed 120 pounds. Oral examination revealed that from one-half to two-thirds of the alveolar structure was resorbed. Mobility was class 3. There was no decay. Fair home care of the mouth was given. The patient lived in an apartment. He bought most of his food at a delicatessen nearby. He had toast and coffee for breakfast; meat sandwich and coffee for lunch; meat, potatoes, bread, pie and tea for dinner. He seldom drank between meals. He took no exercise and got little sun light.

*Read before the American Academy of Periodontology, Minneapolis, Minn., Aug. 17, 1928.

Treatment.—General physical exercise was prescribed and a change of diet was made as follows: Breakfast, fruit and cream, bacon, hard toast, coffee; lunch, half and half milk and cream with graham crackers or a vegetable salad; dinner, meat, vegetables of all kinds, salad, tea or coffee; between meals, milk or orange juice, especially the latter; the intake of liquid to be at least from 1½ to 2 quarts a day. The patient took up golf, moved to a small house and put in a garden, where he raised his own vegetables, etc. While working in the garden, he dressed so as to get as much of a sun bath as possible. The occlusion was corrected, the teeth were scaled and correct brushing was taught.

Outcome.—Fourteen months later, the tissues were normal. The blood count was: red cells, 4,800,000; white cells, 8,000; hemoglobin, 87 per cent. The blood pressure was 135; the weight, 145 pounds. The general health is perfect. The patient is very active and energetic and says that life is worth living.

Case 2.—*History.*—A stenographer, single, aged 32, was anemic and always tired and was underweight. The blood count was: red cells, 3,500,000; white cells, 11,000; hemoglobin, 65 per cent. Blood pressure was 140. Urinalysis was negative. The weight was 110 pounds. The care of the mouth was fair. Mobility of all teeth could be classed as 3. Pus was exuding from around nearly every tooth. From one-half to two-thirds of the alveolar structure was resorbed. The patient lived in a boarding house and took the bus to her office. She had toast and coffee for breakfast, tea and some kind of meat sandwich for lunch and a fairly mixed meal for dinner. She had been treated at two different periods for her mouth condition. The slight improvement was of short duration. She took no exercise and was out of doors very little. She suffered from constipation and drank no water between meals. She had very little sunlight.

Treatment.—The occlusion was adjusted and the teeth were scaled. The patient was taught to brush the mouth at each visit. Her diet was changed as was the diet in Case 1. She began walking the 1 mile to her work and walked fast enough to perspire. She joined a hiking and a tennis club and later took up swimming. She also took as many sun baths as possible.

Outcome.—In eleven months, the teeth were firm, and the tissues were healthy, with no pus. The blood count was: red cells, 4,300,000; white cells, 7,300; hemoglobin, 90 per cent. The blood pressure was 135. The weight was 130 pounds. There is no constipation. The patient feels energetic and is very active. She says that she feels perfect and looks the part.

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Editorials

THE EASTMAN DENTAL CLINIC IN LONDON AND OTHER RECENT DENTAL PHILANTHROPIES

Another instance of the generosity of Mr. George Eastman of Rochester, N. Y., was signalized on April 30, 1929, by the laying of the foundation stone of the new Eastman Dental Clinic in London, England. The ceremony was performed by the Prince of Wales in the presence of a most distinguished audience, consisting of the Right Hon. Lord Riddell, President of the Royal Free Hospital, with which the Dental Clinic is to be connected, Sir Albert Levy, its honorary treasurer, Mr. Stanley Baldwin, Prime Minister, Ex-Secretary the Hon. Frank Kellogg, Dr. Harvey J. Burkhart, representing Mr. Eastman, who was unable to be present, and many other prominent people.

The exercises were conducted with the greatest dignity, and at the same time with a spontaneous recognition of the very splendid philanthropy of Mr. Eastman. Among other things, the Prince of Wales said:

I am very glad indeed to have been invited to perform this ceremony this afternoon because I believe that the work which will be done in the building of which we are about to lay the foundation stone is very important, and one which will contribute directly and materially to the health and happiness of a great many people in these districts.

Good teeth have always been valued, for several reasons. First of all, good teeth are very useful, although, thanks to the development of dental art, I believe that modern substitutes for the genuine article give quite satisfactory results. (Laughter.) Secondly, good teeth are essential to a good appearance, which is a matter of importance to all women and most men since the creation of the human. Thirdly, good teeth are essential from the point of view of general health and fitness, although it is

EASTMAN DENTAL CLINIC, London, England

only comparatively recently that this has been sufficiently realized. Even now I am sure there are many people who through ignorance or carelessness do not keep their teeth in good condition; too many people wait until they have toothache before they pay that dreaded visit to the dentist. But, ladies and gentlemen, there is another obvious, though true, reason for the neglect of the teeth among very many people, and that is inability to afford the cost of dental treatment. The dentist's bills, as we all know, are on the heavy side and there are many who cannot possibly afford to pay them.

Here we have the Eastman Dental Clinic, which will provide free dental treatment for all. Of course, there is nothing like starting from the beginning. Prevention is always better than cure, and special provision will be made for the children,

but the clinic will also provide for adults. There is one point I should like to emphasize: I am told that care of the teeth is of particular importance to expectant and nursing mothers, and special provision will be made in the clinic for this form of treatment, for which, so far as I know, there is no other organized and systematic service in this great city. Of course, a clinic for children is not a new departure, and there are several dental clinics under the London County Council which provide free dental treatment for children attending the elementary schools of London. Admirable work has been, and is being, done, but the provision of this Eastman clinic will afford an opportunity of continuing and enlarging the work and doing it on a very much bigger scale, so, not for the first time, do we gladly and gratefully welcome American assistance. (Cheers.)

Here, then, we shall have a compact institution capable of dealing with all aspects of dental healing, and devoted particularly to the preventive side for children and mothers, but I hope its ultimate influence will be even wider than that and that it will give a further impetus to the education of public opinion generally in dental matters. Our people must realize that if they want good health, they must have good teeth, and if, as I anticipate and hope, the work of this clinic helps to this end, it will have contributed very materially to the health and happiness of the whole nation.

May I say a few words as to how the project came into being? Mr. George Eastman some years ago, with customary generosity and public spirit, established in Rochester, in the State of New York, a clinic for the care of children's teeth under the direction of Dr. Harvey Burkhart. It was a very great success, so great that Mr. Eastman desired to establish a similar institution in London. Lord Riddell and Sir Albert Levy, of the Royal Free Hospital, learned of Mr. Eastman's readiness to build and equip a clinic, and joined forces to provide the additional sums required to maintain the clinic after it was built.

Ladies and gentlemen, I am to be followed by the Prime Minister, and I am well content to leave the actual acknowledgment of the very great gift of this clinic to a far more eloquent speaker than myself, but there is just one more thing I would like to say. This gift and cooperation of one American citizen and the authorities of a great hospital in London furnishes one more instance, if one were needed, of the friendship which exists between the United States and this country. (Cheers.) It is a friendship which springs from kinship of ideals as well as of blood, and it is well exemplified by this most generous and magnificent gift. (Cheers.)

An interesting sidelight on the thoughtfulness of the Prince is shown in the fact that he has sent to Mr. Eastman at Rochester the silver trowel and mallet with which he laid the foundation stone—another evidence of his desire to strengthen the ties that bind the two countries together.

Mr. Baldwin, the Prime Minister, then made a very clever and witty address. He was followed by Dr. Burkhart, who spoke on behalf of Mr. Eastman, and read messages from the President of

the American Dental Association and the secretary of the International Dental Federation.

Altogether the ceremony was outstanding in its importance, and Mr. Eastman may well be congratulated on adding one more link to the chain of good fellowship that exists between the two countries, as well as on the concrete dental service that he has inaugurated for the people of London.

And in this connection, we should never lose sight of his splendid philanthropy in establishing and maintaining the dental dispensary at Rochester, his own city, which has for so many years, under the able directorship of Dr. Burkhart, not only contributed to the welfare of the children and citizens of Rochester but also called attention to the possibilities of this kind of philanthropy on the part of our wealthy men. Would that those who have great wealth at their command might take a leaf from the books of such men as Mr. Eastman, the late Forsyth Brothers, Mr. Rosenwald of Chicago and of such women as Mrs. Carter of Honolulu.

The establishment of the Eastman Dental Clinic in London will have a far-reaching effect in addition to the concrete good done to the citizens in its immediate vicinity. London is a great center, and there is probably no other city which exerts such an influence internationally as this. Visitors from all other countries will see this institution on their trips to London. Even at the dedication there were present prominent members of the dental profession from abroad, and they will carry their message home to their own countries as to the desirability of such institutions. It is always a fine thing to be a pioneer in any forward movement, and Mr. Eastman may well be congratulated on pioneering in this work in Europe.

On a previous occasion, we have stressed the need of large endowments for dentistry, not only for clinics for poor children but also for dental research, to the end that the nature, cause and means of prevention of dental disease may become so well known that, in the fulness of time, we shall be able to eliminate this scourge from the sons and daughters of men. Medicine has had more than $200,000,000 given it for education and research in recent years, much to the benefit of mankind; and now that the significance of dentistry is

being emphasized by such philanthropies as that of Mr. Eastman, it is time that some of our other wealthy men should come to the front and donate the necessary funds to place dental research on a stable basis and show us the way to the prevention of the suffering that we see today.

Since the foregoing was written, two events of great importance to dentistry and to the welfare of the citizens of New York and Chicago have been announced. In the former city, the Guggenheim Foundation proposes to devote between $3,000,000 and $4,000,000 to the establishment of a dental clinic for poor children, with the intimation that others of like character will be established in different parts of the city, until the aggregate may eventually reach $30,000,000. This is the most comprehensive donation of the kind yet made, and New York may well be congratulated on the munificence of one of its leading citizens.

In Chicago, Mr. Julius Rosenwald, whose philanthropy has already been mentioned, has announced that he will establish a dental clinic for poor children in this city. Mr. Rosenwald long ago showed himself a friend of the movement by supporting a group of twelve dental clinics in the public schools of Chicago at a time when dental philanthropy was in its infancy, and now his benevolence is taking even a more comprehensive form in the nature of an institution of the same general character as the Eastman Dispensary at Rochester. Mr. Rosenwald made his announcement during a visit to Rochester and after a conference with Mr. Eastman and Dr. Burkhart, and he expressed himself as full of admiration for what had been done by these two men for the children of Rochester. Mr. Guggenheim has also commended the outstanding service of the Rochester Dental Dispensary and the Forsyth institution at Boston, and thus we see the far-reaching effects of these pioneer movements in their ultimate influence on other worthy men and other cities.

This signal recognition on the part of our public spirited men of the value and significance of dentistry comes at a most opportune time. There is a general awakening everywhere on the crying need

for dental service for our children, and the big-hearted men of America may always be depended on to supply every need which is made sufficiently manifest. We extend our congratulations to Messrs. Guggenheim and Rosenwald, and we welcome them into the ranks of those who have done so much for our future citizens through the medium of dental philanthropy. We can assure them that they will find themselves in most congenial company.

THE NEED FOR FULL TIME DENTAL SUPERVISORS IN EVERY STATE DEPARTMENT OF HEALTH

At a meeting of the state and territorial health officers, June 4, 1929, in Washington, a very important matter relative to dental service was discussed. There is an annual meeting of health officers with the Surgeon General of the U. S. Public Health Service, at which time various matters pertaining to public health are discussed; and, at the 1929 meeting, Hugh S. Cumming, Surgeon General, suggested that the time was ripe to present to the various state health officers the advisability of securing state legislation, if necessary, and sufficient appropriations in order that the states might appoint a full-time dental supervisor to the state board of health.

C. T. Messner, Chief of the Dental Service, U. S. Public Health Service, and C. J. Hollister, Chief of the Dental Division, Department of Health of the State of Pennsylvania, spoke on this subject. They outlined to the state health officers the urgent need for dentistry to be recognized on the state boards of health, and for full-time dental supervisors to be appointed in each state. They discussed the various methods now being pursued in the seventeen states that have dental representation on the state boards of health, and told of the need for the coordinated efforts of workers in this field in order that better results might be obtained.

Without question dentistry has a definite place in public health work, whether it be local, county, community, state or national. The prevalence of dental disease has been so signally demonstrated wherever surveys have been made, and its relationship to the health of the individual or the community has been so undeniably estab-

lished, that there should no longer be any argument in the matter. The factor of oral hygiene in the prevention of disease should claim for it the most cordial recognition on the part of health officers everywhere, and the recent meeting should act as a stimulus to induce those present to take up this question in a whole-hearted way.

It remains for the members of the dental profession in each state to foster this idea by every possible means. Many of our members who read this article are personally acquainted with men in their state departments of health, and if they are not, it is an easy matter to become acquainted. The time has now arrived when our profession must manifest a keen interest in public health, and one of the first steps in this direction is to endorse the suggestion of Surgeon General Cumming and to work for these appointments. Not till dentistry is definitely linked up with public health service shall our profession come fully into its own as an important factor in human welfare, and the time seems ripe for a concerted effort on the part of dentists to gain contact with our state officers of health and then so devote themselves to the movement that every health official will want them as an integral part of his service. Now is our opportunity, and we should not permit it to lapse through indifference or inactivity on our part.

TESTIMONIALS AND THE PROFESSION

It has been aptly remarked that testimonials are the sheet anchor of medical advertising. Testimonials, particularly the uncritical, emanate from two sources—ostensibly from members of a certain profession and from the public. The former includes those who allow the exploitation of their names for an "honorarium"[1] or those who, in a moment of uncritical enthusiasm, are led to relate or write their experiences to the proprietors of a certain remedy; not to mention the frankly dishonest testimonials of this group. However, when the bright light of scientific therapeutics is thrown on the testimonial, there is a fading to nothingness. Testi-

1. Puffery and Yeast, J. A. M. A., 92:2025 (June 15) 1929.

monials from the large body outside the profession may also be said to fall into two groups: those testimonials presumably given by people of the stage, social lights, prize fighters or what are you, which are frankly given for a consideration; and those given by ignorant and uncritical folk who can be said to know no better—again not to mention that group whose main occupation is writing and furnishing of testimonials to patent medicine vendors.

All of these types of testimonials have much in common. They serve the none-too-scrupulous exploiter as advertising bait for the uncritical, among both the profession and the laity. As a rule, they are worthless in establishing the scientific value of the particular remedy, and they all live longer than their writers, to be used as the exploiter sees fit, and almost always without due regard to honesty.

It is not denied that a testimonial may be genuine; may be legally honest and may be absolutely believed by its author. But unless it is supported by technical and specific knowledge of the subject, it is worthless. That is why courts of law decline to accept lay testimonials in evidence. The ignorant may be excused; the selfish testimonial writer and exploiter are frankly branded as dishonest. But only in the most extenuating circumstances can members of a profession be overlooked who, in this day, find themselves guilty of giving, either by word of mouth or by written statement, a testimonial for a product, unless the experience recorded in that testimonial is accompanied by adequate scientific evidence to show beyond a doubt that a beneficial effect was in reality due to the preparation used and not to the practitioner's skill or to nature's healing process. Indeed, members of the American Dental Association must have been aware of the possibility of such situations when they were led to insert in their code of ethics:

> It is unethical for dentists to give testimonials concerning the supposed virtue of secret or proprietary remedies, vaccines, mouth washes, dentifrices, or other articles or materials which are foisted on the public, claiming radical cure or prevention of diseases by their use.

Elsewhere in this issue appears an exposé of some of the methods used in advertising a well-known proprietary. Testimonials from practicing dentists taken many years ago are again being circulated to the profession as "evidence" for its use in dental thera-

peutics. The ridiculousness of its supposed action does not need comment here. It is the publication of these testimonials that is contrary to the best interests of the profession, and as such it is not countenanced by ethical practitioners. The frank disavowal of the writers who were imposed on is evidence that dentists are beginning to realize that testimonial-giving is unfair to other practicing dentists of this day. Dentists now realize that testimonial-giving does not establish the scientific value of a preparation, but it does aid in establishing the commercial value of a preparation.

The testimonial evil is but one phase of the larger problem for the solution of which the profession is asking the aid of the A. D. A. Bureau of Chemistry in its efforts to stamp out the evils of proprietorship of dental materia medica. The response that the profession is giving to the aims of the A. D. A. Bureau of Chemistry encourages the belief that when the field has been cleared of the weeds of worthless and useless remedies, that ground will be planted anew with seeds which will grow and blossom forth into a rational therapy, worthy of the place that scientific dentistry holds in the healing art. The Bureau can furnish the facts; it is for the members of the profession to interpret those facts into action.

WILLIAM A. GIFFEN

(1866-1929)

William A. Giffen, past President of the American Dental Association, died of a heart affection at Grace Hospital, Detroit, Mich., July 3, after an illness lasting two years. He was born sixty-three years ago at Brampton, Ontario. He started out as a veterinary, but in 1901 he was graduated in dentistry from the dental department of the Detroit College of Medicine, since discontinued. He at once became very active in the profession and during the years of his practice he received every honor in the gift of his colleagues. He was president of the First District Dental Society of Detroit, the Michigan State Dental Society and the State Board of Dental Examiners of Michigan. In 1924, at the Los Angeles meeting, he was made President Elect of the American Dental Association and he served at the Dallas meeting.

In private practice, Dr. Giffen was recognized as an expert in denture construction and did much research along that line. He was consulting dentist on Grace Hospital Staff, where a room had been endowed in his honor by the Michigan

WILLIAM A. GIFFEN, D.D.S., F.A.C.D.
(1866-1929)

State Dental Society. He was also a member of Delta Sigma Delta fraternity and held high offices in the Detroit Chapter. He was a past master of Corinthian Lodge No. 241 A. F. and A. M., a member of the Michigan Sovereign Consistory and a director in the St. Clair Country Club.

Dr. Giffen is survived by his widow, Mrs. Alberta Miller Giffen, daughter of an old Detroit family, and two sons, J. Clark Giffen and Ralph P. Giffen, both of whom are practicing dentistry in Detroit. He was one of a family of eight children, the other seven surviving him. Dr. E. L. Giffen of Detroit is a brother.

Masonic services were conducted July 5 at the Scottish Rite Cathedral, Detroit, and the interment was at Brampton.

Dr. Giffen had many lovable qualities and endeared himself to a wide circle of friends both in and outside the profession. He will be greatly missed at our annual gatherings where he was active in every constructive enterprise and where his counsel was constantly sought and freely given.

GUY G. HUME

(1874-1929)

Guy G. Hume, of Toronto, Canada, died June 10 at the Toronto General Hospital after an operation. Dr. Hume was born in Galt, Ontario, fifty-five years ago. He was graduated from the Royal College of Dental Surgeons in 1897, and entered practice in Toronto, specializing in orthodontia. In this he was eminently successful, and in 1914 he was elected president of the American Society of Orthodontists.

At the breaking out of the war, he joined the Canadian Army and was placed in charge of the C.A.D.C. at Niagara Camp. In 1916, he went overseas, where he made an enviable record in the treatment of injuries of the jaws. He was mentioned in despatches, and in 1918 was recalled to America for postgraduate work in jaw injuries to the American and Canadian dental officers. He came out of the army with the title of Lieutenant-Colonel.

In private practice and in private life, Dr. Hume was one of the most exemplary of men. He leaves a record of distinguished and faithful service, not only as a professional man and soldier but also as a citizen. He was modest, almost to a fault, but behind his diffidence there was a force of character that marked him as no ordinary man. He was an ornament to the profession which he served so well, and Canada has lost one of her most illustrious practitioners.

Dr. Hume is survived by his wife (formerly Irene Symons) and one daughter; and by five sisters, Mrs. R. W. MacDonnell of Toronto, Mrs. W. D. N. Moore of Chicago, and Misses Merne, Elizabeth and Nettie Hume of Toronto.

DR. HALL'S ARTICLE DEFERRED

The article promised by Dr. Rupert E. Hall for this issue was unavoidably deferred till a later issue on account of delay in completing the illustrative material.

BUREAU OF CHEMISTRY

ANTIPHLOGISTINE

ANTIPHLOGISTINE (The Denver Chemical Company, New York) is an "argillaceous" poultice recommended by the advertisers for a host of dental and medical conditions, among others for the following strictly medical conditions:

Pneumonia, Pleurisy, Bronchitis (quinsy, pharyngitis, laryngitis, influenza), Dysmenorrhea, Frost-Bites, Sprains. In Burns, for Styes, Ecchymosis (Black Eye), Synovitis, Rheumatism and Gout, Inflammations of the Ear, Mastitis, Throat Infections, Mumps, Croup, Erysipelas, Dermatitis from Poison Ivy and Poison Oak, Orchitis, Epididymitis and Buboes, Felons, Inflammation following vaccination, Chronic Ulcers, Boils, Sunburn, Hemorrhoids, Vaginal Tampon, Inflammatory Conditions of the Abdominal Viscera.

The dental profession, too, is approached. Here, it seems the names of various members have been printed over "case reports" for "use and methods of application which come to the attention of the dental surgeon." Some of the conditions in which it is claimed Antiphlogistine was tried are:

Putrescent Pulp, Post-Operative Congestion, False Ankylosis of Jaw, Post-Extractive Inflammation. Abscessed Molar, Alveolar Abscess, Necrosis, Antritis, Post-Operative Pain, Impacted Third Molar Periostitis, Gingivitis, Fracture of Maxilla, Tic Douloureux.

As inquiries have been made concerning this preparation, it was thought desirable to investigate the claims of composition and therapeutic opinion concerning this proprietary. According to the Denver Chemical Company:

Antiphlogistine is composed of the finest anhydrous and levigated argillaceous mineral, chemically pure glycerine, compounds of iodine (representing a small percentage of elementary iodine), minute quantities of boric and salicylic acids, and oils of peppermint, gaultheria and eucalyptus.

A more definite statement of composition was published about fifteen years ago, from which the following is excerpted[1]:

Water and ethereal oils	4.4 per cent
Glycerin	46.5 per cent
Aluminum silicate	48.0 per cent
Aluminum oxid	0.25 per cent
Iron oxid	0.10 per cent
Salicylic acid, boric acid, hydriodic acids	small amounts

According to this, Antiphlogistine is essentially a mixture of argillaceous earth (kaolin) and glycerin in approximately equal parts. From the foregoing, it is apparent that Antiphlogistine is essentially similar to Cataplasma of Kaolin (National Formulary); hence, it will do no more, no less, than a mixture in equal parts of glycerin and kaolin.

THE MODUS OPERANDI OF ANTIPHLOGISTINE

The action of Antiphlogistine is explained by the Denver Chemical Company in these words:

The skin may be regarded as a permeable membrane, separating two fluids of different densities, the blood and Antiphlogistine.

1. Patent and Proprietary Remedies, 1917, p. 15.

[Doctor, would you consider Antiphlogistine a fluid?] If the Antiphlogistine is applied hot under such conditions, something definite happens and that scientifically—an interchange of fluids, most marked toward Antiphlogistine, hence the deduction that Antiphlogistine acts through reflex action and dialysis, the latter scientifically including the physical processes of exosmosis and endosmosis.

As far back as 1905, Dr. Augustus H. Roth[2] scientifically showed the fallacy and ridiculousness of the foregoing statement by experimental methods. Dr. Roth showed as a result of carefully controlled experiments that:

1. Antiphlogistine[3] did not retain its heat as long as an ordinary flaxseed poultice.

2. Antiphlogistine did not absorb any more, and in some cases absorbed less water than did gauze pads.

3. Antiphlogistine and absorbent cotton, separated from salt solution by different membranes (collodion and fresh human skin) gave different results. Dr. Roth found that the absorbent cotton took up more water than did Antiphlogistine. The statement that Antiphlogistine acts by a special process becomes a *reductio ad absurdum.*

Hence the statements of the wonderful effects of the hygroscopic powers of Antiphlogistine are so manifestly absurd as to be unworthy of further refutation. Indeed, such authorities on pharmacology as Hatcher, Irons, Sollman and Puckner[4] have united in speaking of clay poultices in the following way:

Not superior to flaxseed or bread-and-milk poultices.

This remark is applicable, and with equal force, to Antiphlogistine. Indeed, Dr. Roth, as a result of his experiences, was less restrained concerning the use of this preparation[4] in open wounds. He stated, " . . . but the most ridiculous and likewise most dangerous recommendation is its use in open and septic wounds."

After a consideration of the composition and so-called theory of the action of Antiphlogistine, the advertising methods used by the vendors of the product are of interest because of the unwarranted way in which names of members of the profession have been used. It has been indicated that dentists are reached through testimonials, which indeed are the sheet anchor of medical advertising. The veracity of these "testimonials" was questioned. The doubt arose from recorded experience; for it appears to be an old trick of the Antiphlogistine people to use "testimonials" of which the supposed writer had no knowledge. As late as 1918, the Antiphlogistine people are reported to have circulated among the medical profession testimonials purported to have been made by physicians in prominent industrial plants. The Antiphlogistine people are reported to have written:

It may be of interest to you to know that at the emergency hospital of the Ford Automobile Co., in Detroit, Antiphlogistine is carried in stock and is used extensively in burns, bruises, infected wounds, sprains and other traumatic conditions which are constantly arising in such a plant.

The following reply was sent by the physician who was supposed to be quoted to an inquirer:

. . . will state that no Antiphlogistine has been purchased or used in this hospital for

2. J. A. M. A., 44:1185, 1905.

3. The original article of Dr. Roth did not directly refer to Antiphlogistine, but subsequent developments left no doubt that Antiphlogistine is the product to which Dr. Roth referred.

4. Epitome of the U. S. Pharmacopeia and National Formulary, Chicago; American Medical Association, 1926, p. 104.

years past, and I cannot imagine why the representative of the Denver Chemical Company should make such a statement as attributed to him. . . .[5]

In advertising currently circularized to the dental profession are to be found forty-four testimonials attributed to dentists. A letter from which the following is taken was sent to each of the forty-four dentists over whose names the testimonials appeared:

5. Propaganda for Reform, Chicago: American Medical Association, 1922, p. 404.

DENTAL GLEANINGS

These Eminent Practitioners appreciate the value of Antiphlogistine as an adjuvant in treating dental congestions. Their endorsements place the evidence of merit for the preparation beyond challenge or dispute.

"It would be a difficult matter to say that the exhibition of Antiphlogistine was indicated in any particular malady, for there are few ailments or disorders not accompanied by inflammation, and in the latter it is a specific remedy in dental practice."
Steele F. Gilmore, D.D.S., Indianapolis
(President, Indiana State Dental Association, 1917-8)

"I am convinced that Antiphlogistine has an important place in dental practice. I have experienced its beneficial effects in inflammatory conditions in my own mouth."
Robert Murray, D.D.S., Buffalo
(President, The Dental Society of the State of New York, 1917)

"Have used Antiphlogistine for the various forms of alveolar abscesses with very gratifying results, and find it an invaluable product for many forms of inflammation. Would not be without it for any consideration."
H. A. Maves, D.D.S., Minneapolis
(President, Minnesota State Dental Association, 1917)

"I frequently find occasion to use Antiphlogistine in ordinary home uses with gratifying results."
G. C. Ainsworth, D.D.S., Boston
(President, Massachusetts Dental Society, 1918-19)

"The tooth had a small cavity and finally necrosis developed at root, and there was pus in the antrum. The patient found great relief from the use of Antiphlogistine applied over the affected part. Tooth removed, bone scraped and the case went on to a very good recovery."
J. A. Richards, D.D.S., Plaquemine
(Former President, Louisiana State Dental Society)

"As a reliever of inflamed conditions about the mouth I find Antiphlogistine of great value, especially in cases of abscess resulting from ulcerated teeth and necrosed roots. I have seen a number of cases which were fully set saved from breaking and leaving that dreaded gun-shot wound on cheek."
B. A. Sears, D.D.S., Hartford
(President, Connecticut State Dental Society, 1919)

"I have not employed Antiphlogistine to any great extent in dental congestions, but my experience with it in my home has proven to me that it is a very valuable remedial agent in treating inflammations."
C. E. Ervin, D.D.S., Terre Haute
(President, Indiana State Dental Association, 1918-19)

Many eminent dental practitioners have testified to the fine results obtained from the use of Antiphlogistine in their practices. The following excerpts are from a few of the many cases reported:

"It would be a difficult matter to say that the exhibition of Antiphlogistine was indicated in any particular malady, for there are few ailments or disorders not accompanied by inflammation, and in the latter it is a specific remedy in dental practice."
Steele F. Gilmore, D.D.S., Indianapolis
(President, Indiana State Dental Association, 1917-18)

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"I am convinced that Antiphlogistine has an important place in dental practice. I have experienced its beneficial effects in inflammatory conditions in my own mouth."
Robert Murray, D.D.S., Buffalo
(President, The Dental Society of the State of New York, 1917)

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"Have used Antiphlogistine for the various forms of alveolar abscesses with very gratifying results, and find it an invaluable product for many forms of inflammation. Would not be without it for any consideration."
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"I frequently find occasion to use Antiphlogistine in ordinary home uses with gratifying results."
G. C. Ainsworth, D.D.S., Boston
(President, Massachusetts Dental Society, 1918-1919)

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"The tooth had a small cavity and finally necrosis developed at root, and there was pus in the antrum. The patient found great relief from the use of Antiphlogistine applied over the affected part. Tooth removed, bone scraped and the case went on to a very good recovery."
J. A. Richards, D.D.S., Plaquemine
(Former President, Louisiana State Dental Society)

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"As a reliever of inflamed conditions about the mouth I find Antiphlogistine of great value, especially in cases of abscess resulting from ulcerated teeth and necrosed roots. I have seen a number of cases which were fully set saved from breaking and leaving that dreaded gun-shot wound on cheek."
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"I have not employed Antiphlogistine to any great extent in dental congestions, but my experience with it in my home has proven to me that it is a very valuable remedial agent in treating inflammations.
C. E. Ervin, D.D.S., Terre Haute
(President, Indiana State Dental Association, 1918-19)

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"Antiphlogistine is an old friend; I have been familiar with its use in a dental way for many years."
Edgar O. Kinsman, D.M.D., Cambridge
(Ex-President, Massachusetts Dental Society)

Left: A page from the "Bloodless Phlebotomist" issued in 1919. Right: A page from an advertising circular 1929. (A study in "contemporary" testimonials.)

Dear Doctor.....:

The Bureau of Chemistry of the American Dental Association is preparing to examine the composition, and in collaboration with consultants, to investigate therapeutic claims made for proprietaries sold to the dental profession. This is part of its work to aid in protecting the dental profession and public against objectionable advertising, undesirable secrecy, unwarranted claims and possible fraud in connection with proprietary dental articles. Among the articles extensively advertised to both dentists and the public is ANTIPHLOGISTINE, made by the Denver Chemical Manufacturing Company, New York. Inquiries have been made concerning a recent circular distributed to the dental profession, in which appears a testimonial attributed to you. It reads as follows:

[The testimonial was quoted in full.]

The purpose of this letter, therefore, is to inquire whether or not you are correctly quoted. If so, when was the testimonial given and has your opinion changed since then in view of subsequent experience?

Inquiry is also made whether or not the Denver Manufacturing Company obtained permission to use your name in recent advertising.

It is anticipated that the results of this investigation will be published in *The Journal of the American Dental Association.*

The results of the investigation proved interesting. Of the forty-four letters sent out, the disposition was as follows:

No reply received	15
(Five of these were outside the United States.)	
Not deliverable by P. O. Dept.; moved, left no address; not listed in Post Office Directory, etc.	5
Retired	2
Dead	2
Gave testimonial but opinion changed	2
Same opinion	6
Requested discontinuance	3
No permission to publish	2
Outright denial or no recollection	7

Most of the testimonials were given ten to twenty years ago, or, as one writer apologetically put it, "I was brought up in an atmosphere of poultices, fomentations and so forth." From the foregoing, the reader may judge for himself the authenticity and value of the testimonials which are being broadcast to the dental profession concerning Antiphlogistine. Below are reprinted several testimonials, in each case followed by the writer's reply to the questionnaire mailed from the A. D. A. Bureau of Chemistry. Space does not permit publication of all the replies, but the following may serve to illustrate the reliance which can be placed on these testimonials:

The testimonial:

Every case of alveolar inflammation in which I have used Antiphlogistine the results were uniformly good, and I gladly recommend it in these cases.

W. A. Baker, D.D.S., Tucson,
(Former President, Board Dental Examiners, Arizona).

The reply:

In reply to your inquiry of February 25th relative to Antiphlogistine advertisement of the Denver Chemical Manufacturing Company of New York, wish to say that in my thirteen years of dental practice I have never used antiphlogistine in any single case of alveolar inflammation; neither have I ever used it as a therapeutic agent in any other case of dental pathology.

If my name has ever been used by this company in the way of testimonial, it has been used maliciously. It will give great satisfaction to me to look into this further, and I shall be glad to give you any further information that you may desire.

Please publish this letter in the American Dental Journal if you desire and it will meet with my approval.

The testimonial:

In treatment of severe and acute dental inflammations I have used Antiphlogistine very successfully; it relieves congestion and pain in a short time.

James A. Sinclair, D.D.S., Asheville,
(Former President, North Carolina Dental Society).

The reply:

In answer to your letter of February 25th re: advertising matter distributed by the Denver Chemical Mfg. Company, wherein they have quoted me as a user of ANTIPHLOGISTINE, I have, never to my knowledge, given out any such information or testimonial, and I do not recall that I have ever prescribed the use of it, in any way.

Thanking you for calling this matter to my attention, and assuring you that you have my support in protecting the dental association in the misuse of professional names in this objectionable advertising.

The testimonial:

There is no better application than Antiphlogistine to relieve swollen, painful or abscessed conditions encountered in dental practice. Have also used it in sore throats and colds with success.

A. Aime Lantier, D.D.S., Quebec,
(Ex-President, Canadian
Dental Association).

The reply:

Referring to your favor of February the 25th, I must say that I do not remember giving such testimonial to the Denver Chemical Manufacturing Co., re: Antiphlogistine.

The testimonial:

I have had excellent results with Antiphlogistine in cases of periostitis, and consider it a valuable remedy in cases of that kind.

Arthur H. Palmer, D.D.S.,
Pasadena, Calif.

The reply:

In reply to yours of February 25th, I do not remember giving a testimonial to Antiphlogistine and have never used it in dentistry.

The experience of one writer to whom a testimonial was attributed may be helpful to members of the profession who are importuned for a "record of clinical experience."

In reply to your letter of February 25th, relative to my testimonial in behalf of Antiphlogistine, let me say that something over twenty years ago I did make the statement attributed to me. In more than twenty years, however, I have not set a fractured jaw nor have I prescribed Antiphlogistine.

The statement attributed to me was made to the representative of the Denver Manufacturing Company, who was a frequent caller at my office during the first year or two of my practice. He was a very delightful friendly old gentleman who seemed to take quite an interest in me and I fear my testimonial and zeal for Antiphlogistine were largely in the way of a friendly reaction toward this kindly personality.

The writer of this letter points out a moral for all practitioners. Dentists are now appreciating that testimonials are the sheet anchor of medical advertising. Because of their supposed appeal to experience, their commercial value is large; because the experience recorded in a testimonial from members of a profession is, as a rule, not accompanied by adequate controls, their scientific value is nil. Some years ago, Prof. Torald Sollman of Western Reserve University stated:

When commercial firms claim to base their conclusion on clinical reports, the profession has a right to expect that these reports should be submitted to competent and independent review. When such reports are kept secret, it is impossible for any one to decide what proportion of them are trustworthy, and what proportion thoughtless, incompetent or accommodating. However, if this were done, it is quite possible that such firms would find more difficulty in obtaining the reports. Those who collaborate should realize frankly that under present conditions they are collaborating not so much in obtaining the scientific value, but rather in establishing the commercial value of the article.

To further comment on the worthlessness of these testimonials and the improper use of names in connection with them would be useless. Facts are more eloquent than words.

Any endeavor to misuse the names of practitioners is looked on askance by the profession. This is our apology for giving the amount of space necessary to an understanding of the irrationality of the claims for Antiphlogistine and the method used in its exploitation.

BUREAU OF DENTAL HEALTH EDUCATION

THE INDIANAPOLIS FREE DENTAL CLINIC

By EZRA E. VOYLES, D.D.S., Indianapolis, Ind.

ORIGIN

FOR thirteen years, free dental clinics for children have been operated in Indianapolis. Not until 1919 was the service more than spasmodic. In March of that year, it was definitely put on a sound and dependable basis and since then the schedule has been continuously maintained.

The achievements of those early days, ten or twelve years ago, seem small enough now, but in their time they brought considerable satisfaction; and in them was also the vision of what might be attained in the future. It required some faith to follow that vision and some perseverance. The realization of it was not easy, and the period of early development was full of trials. Many adjustments were found necessary, and an understanding of, if not always with, other individuals and organizations had to be reached. Many details of operation and functioning had to be wrought out on an anvil of experience.

Nevertheless, the foundation work having been completed, we have been able to mark almost from month to month the growth and realization of the dream. The year 1920 saw us with one clinic station and a list of 340 children whose needed work had been completed during the year. We closed the year 1928 with ten stations, operating a total of forty-three clinic periods each week, and a record of 4,084 children cared for.

The clinics were originally under the direction of the children's aid association and continued to be so until that society was reorganized in 1922. Out of this reorganization sprung the child hygiene division of the city board of health and coordinated under this are all the child health activities, including the children's dental clinic, the prenatal clinic and the baby clinic.

It is felt that this program is sufficiently inclusive to offer the maximum of health service to those who are financially unable to secure such services from private sources. Beginning with the prenatal stage and carrying the cases up to and many times through the high school age not only offers restorative dental services but also combines with it the greatest measure of preventive dentistry. Throughout all these stages, an effort is made to inculcate a knowledge of prophylaxis, diet and mouth hygiene and to convey this to other members of the family.

ORGANIZATION

To the perfection of the organization, we are indebted to Herman G. Morgan, secretary of the city board of health for the last eighteen years and to Mr. Paul Kirby, director of clinics, for ten years. Dr. Morgan was successful in getting a

grant of funds sufficient to initiate and carry on some of this work. Later, he was able to bring the entire division under the city board of health budget, which is financed by taxation. Mr. Kirby evolved the clinic procedure through a study of similar service at Rochester, Boston, Bridgeport, etc., with special attention to the necessities of local conditions.

The organization consists of the secretary of the city health board, the supervisor of nurses, the director of clinics, who at present is a graduate nurse, and the staff of doctors, dentists and nurses. Five doctors and fourteen nurses are in charge of the baby health stations. Four doctors and two nurses have charge of the prenatal clinics. The dental staff includes thirteen graduate dentists, one orthodontist and six dental assistants operating at ten stations located for convenience.

The school nurses are assigned one nurse to two or three schools, this depending on the size of the school. This service covers both public and parochial school as well as kindergarten.

Cases in need of dental attention are discovered through regular dental inspection carried out by the nurse and the school physician, and their belief as to the need of dental service is confirmed by the dental clinician.

Besides this, the various organizations cooperating with them include: nutrition nurses, baby nurses, kindergarten nurses, tuberculosis nurses, public health nursing association, family welfare society, board of children's guardians and the social service departments of Long Hospital and the city hospital.

Fig. 1.—Babies from the baby health clinic, child hygiene division of the city board of health.

THE PLAN

Once a child is found to need dental service, the case is investigated by the

nurse to determine its eligibility from a financial standpoint. If found worthy, it is directed into the proper clinic after permission to take the child out of school is obtained.

In 1920, the small staff of volunteer dentists was put on a pay basis, which has been maintained to the present time with entirely satisfactory results. Through conference, past experience and custom, a rule of procedure has been built up that assures the desirable degree of uniformity and practice, without eliminating individual initiative on the part of the operators.

Our plan is to have each dentist with an assistant assigned a definite schedule. The two are at the designated station for the same period each week. Appointments are made so that patients return to the same operator until the work is completed. The appointments are made only through school nurses or social workers who can vouch for the eligibility of the child from a financial point of view.

Through this system of appointments, only children evidently needing dental attention and only those whose circumstances would not permit their having the work done in a private office are brought to the clinics. Moreover, the responsibility of seeing that the child returns for completion of his work is partly assumed by the person making the appointment.

The dental assistant at each clinic keeps the schedule of appointments, and aids the dentist as in a private office. She also keeps each child's individual chart and record under the direction of the dentist and compiles the statistics of her clinic work.

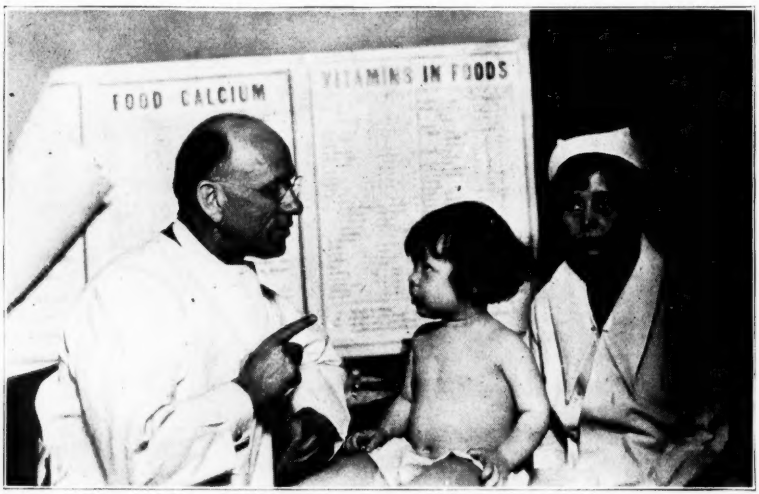

Fig. 2.—Physician, baby and nurse at baby clinic, which is conducted by the child hygiene division, of the board of health two mornings a week.

THE SCOPE

We have felt compelled to broaden the scope of the work as time has gone by. Prophylaxis, extractions and simple fillings were clearly to be carried out, but it became evident that in dealing with these poorer children, whose only chance for dental care was through our clinics, a more inclusive service should be made available. Our purpose has been to put each mouth in good condition. Naturally, in a few cases, extraction of anterior teeth is necessary. To take out a central incisor of a girl soon to be a woman and do nothing more seemed to be rendering a rather doubtful service, and to turn away a child clearly requiring orthodontia, after filling a few cavities, seemed to be but partially meeting our obligation to him. So we were obligated to include an occasional root canal treatment, gold inlay, porcelain crown or fixed bridgework.

Fig. 3.—Weighing the baby. The weight is carefully watched at the clinic.

In the prenatal department, we find some cases in which the health of the prospective mother is undoubtedly impaired by the presence of broken down and diseased teeth, which may easily have a direct bearing on the health of the offspring. In such cases, we have felt compelled to clean out the mouth and make dentures.

With the volume of children handled, we naturally come upon many cases of the most extreme malocclusion which we could not turn away, and we therefore, about three years ago, opened the orthodontic department. This has proved to be one of the most worth while phases of the entire program. With careful organization, a capable assistant and duplicate chairs, we are able to carry about sixty-five cases under treatment, using three clinic periods a week.

The general dental clinics during 1928 kept 11,793 appointments. They served a total of 4,084 children. There were 6,068 extractions, 6,787 amalgam fillings, 418 porcelain fillings and 2,621 prophylactic treatments, besides a number of gold inlays, porcelain crowns and bridges.

It is believed that with such opportunities as are offered in our free clinics, there is no reason for any child in Indianapolis to be regarded as underprivileged in health service.

808 Odd Fellow Building.

THE CHICAGO HEALTH DEPARTMENT'S EFFORT TO SAVE CHILDREN'S TEETH*

By L. W. MORREY, D.D.S., Chicago, Ill.

JANUARY 28, the Chicago Department of Health reopened ten dental clinics for children in ten of the public schools of Chicago. This was made possible by the fact that the city council appropriated funds in the last budget for a dental hygiene bureau. Too much credit cannot be given the members of the Chicago Dental Society, the Federated Women's Clubs, the Parent-Teacher Association and other allied organizations for making this appropriation possible.

However, the opening of these ten clinics to care for the dental needs of poor children is but a small part of the new dental health program being instituted for Chicago schools.

February 11, ten dental hygienists begin working in ten school districts for the children of the elementary grades. These young ladies will teach mouth hygiene to the children in the kindergarten and the first four grades. In company with ten dentists, they will carefully examine the mouths of these children and inform the parents of the condition of the teeth. If in the course of the next few months, any of you mothers or fathers should receive notice that your child is in need of dental attention immediately, take your youngster to your family dentist and have the defect corrected before serious damage results. The old axiom of "a stitch in time saves nine," or "an ounce of prevention is worth a pound of cure" holds good in dentistry as well as in other walks of life. The early detection and correction of dental defects may, and probably will, save your child many hours of pain, physical suffering and hard cold cash later on in life.

A diseased or unclean mouth is the most prolific source of danger to the health of the child of which we have any knowledge. Sir William Osler says, "There is not one single thing in preventive medicine that equals mouth hygiene and the preservation of the teeth." Charles H. Mayo, of Rochester, Minn., has said:

> Nearly all people of middle life who are suffering from rheumatism, heart disease, recurring attacks of lumbago, muscular rheumatism, sciatica, neuritis, iritis, hemorrhages and so forth, have a small lesion or focus which from time to time delivers bacteria into the blood and they are carried by the blood stream to a previously weakened spot. Again, the recurrent disease is produced and runs an acute or chronic course, developing immunity by reaction and making improvement for an indefinite but not permanent period. The curious sudden relief from maladies caused by such foci of infection in the past led to the recommendation of many eccentric remedies such as the carrying of a rabbit's foot, dried potatoes, rheumatic finger rings and the use of various dopes internally and externally. Even today you will find in the medicine chest in many of our homes bottles of tooth ache drops, tooth ache paste and tooth ache gum to be applied to the offending tooth. The only

*Broadcast over WBBM, Feb. 1, 1929.

result accomplished by these remedies is to dull the cry of an outraged nervous system which is trying to tell you that something is wrong with either your tooth or your child's tooth, as the case may be. Further, the use of these remedies in many cases seals in thousands of bacteria which may cause more serious disorder later.

We are hosts to innumerable bacteria, says Dr. Mayo. Thousands of microbes enter the mouth and more than sixty varieties make their home there. Not all at once but in harmonious groups such germs are harbored in the lymphoid tissue of the mouth, tonsils and adenoids, but because of increased opportunities, they develop more often in diseased gums, dead nerve pulps of teeth and apical or root abscesses. In fact, the tonsils are often infected from bad teeth. From this statement, coming as it does from one of the leading medical men in the country, you can readily understand why it is important that your child receive early and regular dental attention. Dr. Mayo says infection or bacteria are found in and about pulpless teeth, not solid, healthy live teeth; therefore, your problem is to conserve the life of your child's teeth from the very beginning; in other words, "lock the stable door before the horse is stolen."

Statistics show that in Chicago alone fully 96 per cent of school children have defective teeth. That means that at least 500,000 children are harboring defects which are preventable, defects which at some later stage in life may cause serious systemic disease.

William Black makes the statement that 25 per cent of us have septic mouths at the age of 25 and, at 45, 90 per cent have septic mouths. There are hundreds of people that are going up and down our streets suffering from poison that is going into the system by absorption of protein from bacteriologic infection of the mouth. Of these same people, 90 per cent would not be suffering from this absorption of infection had they received the proper dental treatment when they were young.

Dental caries is a disease of childhood. Pyorrhea is a disease of old age. Mothers and fathers must be made to realize that the filling of the small cavities in their children's teeth before the pulp is involved or before the nerve has died is infinitely more important than all the fancy bridgework and beautiful restorations that their highly skilled family dentist can put in later on in life.

In Chicago alone, our citizens are spending about $10,000,000 a year for dental attention, most of which is spent to replace lost teeth with bridgework, partial and full dentures. I fully realize that there are instances, such as accidents or perhaps systemic conditions which make the removal of teeth and the substitution of mechanical appliances necessary, but I am also fully convinced that early and regular dental attention during childhood would cut that $10,000,000 annual dental bill to at least one fifth of that figure.

This does not take into account the enormous amount of physical suffering resulting from these same dental defects. The most recent information derived from the United States Government discloses that more children between the ages of 10 and 14 die of heart disease than from diphtheria, croup, typhoid fever, scarlet fever, measles and whooping cough combined. Heart disease among children is on the increase, while these other diseases just mentioned are rapidly being placed under control.

The New York Society for the Prevention of Heart Disease roughly divides the responsibility for this disease between contagious diseases and focal infection.

The tonsils and teeth are the seat of most focal infection. Probably about 25 per cent of these cases are caused by infected teeth.

The vital statistics in the State of Illinois show that more people die of heart disease than from pneumonia and nephritis combined and more people are dying of heart disease in the State of Illinois than from cancer and tuberculosis combined. Again, much of this trouble is laid to infected teeth. There is absolutely no need for you or especially your children to harbor infected teeth. Prevention is the watch word today in dentistry as well as in medicine. Prevent the tooth from becoming infected. A live tooth will not become infected. Only when the pulp or nerve has been exposed owing to the presence of a large neglected cavity will that tooth become susceptible to infection.

Here are six simple laws or rules which have been advocated for the prevention of dental decay:

1. Diet. Proper diet for the child means plenty of milk, dairy products, vegetables, especially leafy vegetables, whole grain cereals and bread and fruit each day. These foods contain tooth-building material. In order to build strong teeth, we must put the right material in them.

2. Rest. Every child should receive ten hours of sleep each night. No child can develop a strong healthy body or a set of strong healthy teeth without adequate rest.

3. Exercise. The gums and teeth should be exercised by chewing a certain amount of hard, coarse vegetables and crusts each meal.

4. Sunlight. Every child should be exposed to the rays of the sun in order to develop good bones and good teeth. During the winter months, when sunlight is at a premium, cod-liver oil can be used as a substitute.

5. Cleanliness. Every child should be taught to clean his teeth twice a day—every morning and every evening, especially before going to bed at night.

6. Regular and early dental attention by a competent dentist. Every child should be taken to the dentist as early as 2½ years of age and thereafter at least every six months, so that dental decay can be stopped before any serious damage to the pulp of the tooth has been done.

Allow me to repeat: No child can grow into strong manhood or womanhood if harboring defective teeth. The proper time to prevent defective teeth is during childhood. Endeavor to give the child good strong teeth to begin with and then keep the teeth sound and healthy after they erupt.

THE MOUTH HYGIENE PROGRAM FOR CHICAGO SCHOOL CHILDREN*

By E. BYRON KELLY, D.D.S., Chicago, ILL.

FOR the past twenty years, the Chicago Dental Society has viewed with alarm the steady increase in dental decay in the mouths of our school children.

For at least the past fifteen years, the Chicago Dental Society has believed that operative procedure alone cannot remedy this condition. During the past ten years, we have realized that only through education can we hope to overcome this most prevalent disease of childhood.

Dental disease, that is, the presence of decayed and abscessed teeth, unhygienic mouth conditions, soft bleeding gums and pyorrhea, is the scourge of modern civilization. Not only is it most prevalent but it is also, to a certain extent, preventable.

It is only by teaching the public how they themselves can develop and maintain good teeth that the dental profession can hope to overcome this disease. The proper time to start this education is in childhood. The proper place to do this educational work is in our schools.

If it were possible to teach our children the rudiments of mouth hygiene; if we could teach them to eat the right foods to build strong teeth; if we could teach them the vital necessity of keeping their mouths clean by brushing every night and morning; if we could teach them to visit their dentist twice a year and have a thorough dental inspection, thereby eliminating decay while the affected area is still small and before serious damage has been done, we would be able to save for our school children thousands and thousands of teeth that are now being lost.

In a dental survey made last April in our schools by Arnold H. Kegel, commissioner of health, and members of the Chicago Dental Society, it was found that 96 per cent of the children had decayed teeth ranging from one cavity to twenty cavities for each child. There is an average of about five decayed teeth in the mouths of each of our 500,000 school children; making a total of 2,500,000 decayed and abscessed teeth in our schools.

The unfortunate part of this condition is that fully 50 per cent of the mothers in Chicago would have these conditions corrected if they knew that the child had defective teeth. However, not 10 per cent of our children receive regular and systematic dental inspection. Consequently, the teeth are allowed to decay until excessive pain drives the child to the dentist. In many cases, the damage is so great, the decay has progressed so far, that extraction or pulling the tooth is the final result, and the child goes through life a dental cripple.

The erroneous impression that many mothers still have regarding the care of baby, or deciduous, teeth has resulted in much damage also. The old idea that baby teeth do not need attention has been

*Broadcast over WBBM, June 18, 1929.

exploded. Deciduous teeth are just as important to the child as permanent teeth are to an adult. If Mother Nature had not intended the child to use those baby teeth until they were replaced by the second or permanent set, she would never have given them to the child in the first place. Scientists will tell you that the most important years of life are the years during the developmental period or during childhood. If those baby teeth are allowed to decay, the child cannot chew its food properly; if the food is not chewed properly, it cannot be digested properly; if it is not digested properly, it cannot be assimilated properly, and if it is not assimilated properly, the child cannot grow into strong manhood or womanhood.

Not only does the child's digestive system suffer when the deciduous teeth are decayed, but the permanent teeth are affected also. The decayed deciduous tooth sooner or later comes in contact with a permanent tooth. The decay in the baby tooth will cause decay in the permanent tooth, just as one bad apple will decay the apple next to it.

There are three rules to follow to overcome this condition.

1. The children and the parents must be educated that both the baby teeth and the permanent teeth are an important part of the individual's body. Only when those teeth are kept in a clean, sanitary, wholesome condition can they function normally.

2. Regular and systematic inspection of each child's teeth at least twice a year is essential. Obviously, it is impossible to expect the child to apply for that inspection. Therefore the logical step is to bring the inspection to the child, just as we bring his other education and mental inspection to him each year.

3. Early and positive correction of dental defects must be undertaken before they have become large and infectious.

"An ounce of prevention is worth a pound of cure" applies to dentistry as well as other walks of life. The only preventive measure that the dentist can take is to remove the decay while it is still small and replace the infected tooth material with filling material. The real steps for prevention must be taken by the child itself and by the mother of the child by eating the foods that will develop strong teeth and then keeping them clean and in a wholesome condition.

This problem of children's dental decay has become so serious that many of the more progressive cities in this country and in Europe are taking decided steps to prevent it. Germany for many years has had regular dental instruction and care in its schools. Practically all of the largest cities in the United States and Canada have established a department of mouth hygiene either in their department of health or in their board of education to instruct and care for their children. The Forsyth Institute in Boston has long been a shining example of what can be done to improve dental conditions in children. Bridgeport, New York City, Minneapolis, Kansas City, Los Angeles, Cleveland, Cincinnati, all spend from $35,000 a year to $125,000 on dental education and care for their children.

Chicago, a city of 3,000,000 people, spent last year $20,000 to instruct and care for the dental needs of its 500,000 school children. This appropriation is ridiculously inadequate when we consider that 96 per cent of our children have decayed teeth and that each of those teeth that are abscessed is a potential

source of heart disease, kidney disease or other systemic disturbances.

At the present time, the Chicago Dental Society, the Chicago Federation of Women's Clubs, the parent-teacher association, the board of education, the department of health and the united charities and the council of social agencies are uniting their efforts to secure an adequate dental appropriation from our city council for the school children.

The plan calls for regular inspection of school children's teeth at least twice a year, with proper parental notice of conditions, mouth hygiene instruction for both the children and their parents and operative or reparative service for those children who, for economic reasons, cannot afford good dental care. This dental bureau will be made a permanent part of the city department of health and will function for the benefit of the children. It will cost the city about $63,000 to install this bureau and $173,000 a year to maintain it.

Money is needed to establish and maintain this important service. It must come from the city council. A request is now before the city council for this appropriation. We believe that it is economy to spend a few thousand dollars to save a few hundred thousand.

THE NECESSITY OF MOUTH HYGIENE EDUCATION IN THE CHICAGO SCHOOLS*

By F. E. PORATH, D.D.S., Chicago, Ill.

IN the days of old when minstrels sang the stories of great loves and handed down by word of mouth the lover's listing of his lady's charm, her pearly teeth received their meed of praise. And ever since that distant time when Solomon's Song told of teeth like the wool of new washed lambs, and "cheeks comely with rows of jewels," the authors of the West have vied with the fervid imagery of the Orient to make famous the lure of an attractive mouth. All history has told of beauty and character expressed by the mouth. "A pomegranate cut in twain with a knife of ivory"—"teeth like milk" are extravagant phrases that run through ancient romances. The bright smile has, and always will have, a definite charm and irresistible appeal.

While there is no doubt of the esthetic value of an even, clean and perfectly arranged set of teeth, Nature has another much more important function for the mouth to perform.

Modern civilization, with all its scientific research, has brought to the tables of the American people a bountiful supply of highly concentrated foods which are lacking the elements needed to produce the stimulation of teeth and gums, so necessary to a mouth that is "comely with rows of jewels."

Science has proved that dental defects, decayed and abscessed teeth, and other oral diseases are responsible for a great many bodily disorders. It is a known fact that dental decay is the most prevalent disease of childhood. It causes the child to lose more time in school than any other single ailment.

A committee of dentists in the city of Boston recently estimated that it cost 3 cents an hour to educate a child in the

*Broadcast over WMAQ, Dec. 20, 1928.

parochial schools of that city. We know from statistics compiled by the Chicago Board of Education that it costs $81 a year to educate a child; or 9 cents an hour. Every hour that our children lose because of toothache or dental disorders costs the taxpayers 9 cents. Multiply that by 600,000, the number of school children, and you can readily see what this disease alone is costing us.

When we stop to consider the number of children who have become ill owing to lowered vitality resulting from abscessed and infected teeth, this figure can be multiplied many times over. It has been conservatively estimated that Chicago spends $3,500,000 a year to educate repeaters, 70 per cent of whom are retarded by physical ailments. Further, it has been estimated that at least 25 per cent of these repeaters could be saved by curing their dental disorders. If this is true, dental defects in Chicago schools are costing the taxpayers $850,000 a year.

Dr. Keyes, of Boston, who has done considerable work on mouth hygiene education of school children, reports that, in the Boston schools, there was an increase in daily attendance of 2.8 per cent after the children had received thorough dental care. In Cambridge, Mass., there was an increase of 3 per cent after similar service was rendered. In other words, he estimated that in the Cambridge schools alone a saving of $25,000 was made by the school authorities by the installation of mouth hygiene educational service for their children.

In Atlanta, Ga., Mr. Sutton, superintendent of schools, reports that in one school where dental instruction and care was installed 1,200 school days were saved in one year's time. Mr. Sutton further reports that, after five years of intensive dental education and care, every child in the public schools of Atlanta had 100 per cent teeth—no dental defects and no dirty teeth.

Athens, Ga., a small sister city of Atlanta, reports that every one of the children in their public schools has 100 per cent teeth. This was accomplished by three years of hard work on the part of the school board, the health department and the local dentists.

Toronto, Canada, reports that, in ten years, their health department reduced the number of cavities in the mouths of the children from an average of seven to an average of two for each child.

Dr. Fones in Bridgeport, Conn., reports that, in five years, the school authorities reduced the number of repeaters 65 per cent by teaching mouth hygiene. In Boston, at the Forsyth Infirmary, the number of extractions of first permanent molars was reduced from one in three to one in 200 by five years of intensive preventive dentistry in the public and parochial schools.

The time is too short to relate to you all the dental health accomplishments of other communities. What we are interested in at the present time is the dental health of our own children in Chicago.

Neither our health department nor our board of education are doing any constructive dental health education or operative work for our children worthy of the name. While other cities, such as Cleveland, with a school population of about 200,000 children, are spending as high as $125,000 a year to save the children's teeth and incidentally their health, Chicago, with a school population of approximately 600,000 children, is spending, through the board of education and the department of health, $24,000. Where other cities are spending as high as $3.50 a year for each child for this branch of public health work, Chicago

spends 4 cents a year. Think of that figure for a moment. It costs Chicago about 9 cents an hour for the general education of a child, yet we only spend 4 cents a year to prevent dental decay, the most prevalent of all childhood diseases.

Both our department of health and our board of education appreciate the fact that dental disorders are a menace to the child's health and mentality. Both of these departments feel that preventive measures must be undertaken by our city to remedy this condition. Both feel that as the children of today are destined to play so important a part in the affairs of tomorrow, we are certainly lacking in vision if we fail to do those things posterity has a right to demand of us. One of the principal things we should do is to see that these bodies which are to bear the children of the next generation are physically sound for this purpose.

The Chicago Dental Society, the Illinois Federation of Women's Club, the Illinois Council of Parents and Teachers, the Council of Social Agencies and the United Charities are all joining with the board of education and the department of health to eradicate defects from the mouths of these children.

All of these organizations have joined in asking our city fathers to set aside a sum of money from our current income to fight this disease. All of these organizations feel that adequate dental inspection and instruction, education and some reparative service properly supervised will reduce dental defects for our children just as it has for the children of other cities.

Through the combined efforts of the medical profession, departments of health and educators, we have reduced smallpox, malaria, typhoid and tuberculosis. Now let us join our forces to eradicate that most prevalent of childhood diseases —decay of the teeth.

May I ask you to join with these civic organizations in stamping out this disease?

CURRENT LITERATURE

EXTRACTS AND ABSTRACTS

Postherpetic Trigeminal Neuralgia: Two cases of trigeminal neuralgia in which pain persisted after section of the sensory root of the gasserian ganglion are reported by Max Minor Peet (*J. A. M. A.*, May 4, 1929). In the first cases, in a woman, aged 70, the pain was excruciating and occurred in paroxysms, most frequently at night. An herpetic eruption was present over the cheek and frontal region. An attempted injection of the gasserian ganglion with alcohol was unsuccessful. The pain increased and became almost continuous. Exposure to a breeze or touching the face could initiate pain. Morphin alone gave some, though not complete, relief. After seven months, the entire sensory root of the gasserian ganglion was divided. Pathologic examination revealed a decided localized inflammation, perivascular infiltration and neuritis. After two months, the pain returned, but it was much less severe, yielding to applications of heat or administration of 10 grains of acetylsalicylic acid. External application did not elicit pain and the patient seldom suffered at night. Although thus benefited by the operation, she continued to suffer much of the time up to her death, one year later. In the second case, in a man, aged 69, the symptoms were practically the same, being virtually the symptoms reported in cases of tumor of the gasserian ganglion, and they did not vary from

those seen in trigeminal neuralgia except that there was a constant burning ache in the affected area. Section of the gasserian ganglion gave little relief, although the area was no longer so sensitive to touch. Attacks were so frequent as to incapacitate the patient for business. An extension of the painful area is taken to indicate that some central process must still be active. The author concludes: Postherpetic trigeminal neuralgia may persist for years, especially in the aged. It is usually characterized by two types of discomfort: a constant, dull burning ache and recurring paroxysms of extremely severe, sharp, shooting, lancinating pains. The symptoms are often identical with those described in many cases of gasserian ganglion tumor. Both irritative and destructive lesions have been found in the gasserian ganglion after trigeminal herpes zoster. However, no central lesions other than simple degeneration of the tracts have been observed, although the persistence of pain after section of the sensory root indicates some form of central pathologic condition. After cervical herpes perivascular infiltrations have been found to extend as high as the internal capsule. Peripheral neurectomies and deep alcohol injections have not given permanent relief. This result should be expected, since definite pathologic changes are known to be present in the gasserian ganglion. In the two cases of postherpetic trigeminal neuralgia here reported, there was persistence of pain after section of the sensory root of the gasserian ganglion. One patient was considerably improved, the paroxysms of excruciating pain being abolished, but attacks of somewhat duller pain persisted till her death a year later. In the second patient, the frequency and intensity of the paroxysms were undiminished, although peripheral stimulation no longer induced an attack. The complete, permanent relief so certain for major trigeminal neuralgia cannot be assured the patient with postherpetic neuralgia. However, since the results Harris obtained in three cases by alcohol injection of the gasserian ganglion were so favorable, I advise section of the sensory root in the belief that some patients will be benefited.

Constitutional Factors in the Causation of Sterility: Of chronic intoxications the most important are those resulting from chronic focal infections. It may seem a far cry from tonsillitis or bad teeth to sterility; nevertheless, the depressing influence of focal infections on the vital functions is evidenced by the fact that the basal metabolic rate is subnormal in a considerable proportion of cases in which such infections are present. Chronic intoxication lowering fertility can also result from disturbances in the digestive tract; from poisons such as alcohol, morphine and lead; and from syphilis. The metabolic faults of extrinsic origin (distinguished from those of intrinsic, or endocrine, origin) are mainly errors in diet and the lack of sufficient exercise to insure good assimilation. Both the breeders of animals and the experimental biologists have abundant evidence of the influence that diet exerts on fertility. The commonest faults in human patients are an excess in the total quantity of the food, and a relative insufficiency of proteins, mineral salts and vitamins. Even an obese patient may thus show protein starvation and cellular malnutrition. The familiar picture of obesity, amenorrhea and sterility results not infrequently from metabolic faults of this type, without any endocrine disturbance. Conditions of general debility sometimes, though by no means always, lower fertility. Anemia, even of slight grade, seems particularly likely to have this effect.—Samuel R. Meaker, in *J. A. M. A.,* May 4, 1929.

Stomatology: A Problem in Education: In brief, then, the situation is this: Oral disease and deformities and the relation they bear to general body conditions is a phase of medical science that has been neglected because of an illogical division of effort between the dental and medical curriculums. The intellectual qualifications and coordination of effort are the same for the study of oral as for all medical problems; hence, it is obvious that the work can be done most effectively and economically by trained scientists in medical institutions. Dental graduates are not qualified for this type of work; nevertheless, the dental point of view, born of special interest in the teeth and associated structures, is absolutely essential. Even though there is evidence of an awakened interest on their part, it is not expected that medical scientists, pursuing other problems, will forsake them for this new field. A new group of workers must be created. At the Yale University School of Medicine a group of scientists have organized for the study of oral diseases and deformities as problems of general pathology. This is in no sense the inauguration of a dental

school of the conventional type. The idea is to develop a department in medical science that will create a liaison between the dental technician and the physician. The new group of workers thus formed, with the training and experience it is proposed to give them, will in time be a source of teachers and investigators for dental and medical schools.—A. LeRoy Johnson, in *J. A. M. A.*, May 4, 1929.

Foreign Body in Bronchus: An atyical case of organic foreign body in a bronchus is reported by John Miller (*Am. J. Dis. Child.*, June, 1929), who lists the salient points, given in Jackson's textbook, on which a diagnosis of organic foreign body can be made. 1. Initial laryngeal spasm. 2. Diffuse purulent tracheobronchitis developing within twenty-four hours in children under 2 years of age. 3. Fever, toxemia, cyanosis, dyspnea and paroxysmal cough appearing promptly after the initial spasm. 4. The frequent inability of the child to cough up thick, mucilaginous pus through the swollen larynx and consequent possibility of "drowning in its own secretions." 5. Huskiness of the voice, but no loss of the voice as in diphtheria. In the case reported, the usual symptoms did not appear and the history gave little help, because there was no definite knowledge of aspiration of a foreign body, and there was no fever or other signs of constitutional reaction, the only local symptom that might have been caused by the presence of a foreign body being a cough, which was transitory and nonproductive. Two roentgen examinations gave little information. Without the fear of the mother, who has been a nurse and had recently seen a case of foreign body in another child, there would have been no intervention until pulmonary changes had made it imperative. Bronchoscopy yielded a piece of peanut, but forty-four hours thereafter tracheotomy became necessary. The tube was left in ten days, and recovery was uneventful.

Therapy Used in Rheumatic Children: 1. General hygienic measures in the home, sunlight, ventilation, avoidance of overcrowding, suitable food, adequate rest, outdoor activity. 2. Regular attendance at clinic in winter and at long intervals during the summer. 3. Local measures—dental care; tonsillectomy in most cases. Nose and throat kept clear by antiseptic instillations and gargles. 4. Acute infections of the upper respiratory tract to be regarded as serious and so treated. The treatment of chronic infection in the nose and throat is not altogether satisfactory, but it is thought that general hygienic measures and local treatment are of assistance.—E. Blanche Sterling, in *Pub. Health Rep.*, June 21, 1929.

Actinomycosis: Two classic examples of actinomycosis of the jaw are reported by Norman Epstein and Paula Schoenholz (*California and West. Med.*, June, 1929). From one case, *Actinomyces bovis* was cultivated and a specific vaccine was prepared. However, the patient was cured by foreign protein therapy, a killed typhoid, paratyphoid A and B vaccine being employed before the specific vaccine was used. The iodids are considered helpful in treatment but are not specific. When not tolerated well by mouth, the drug may be given intravenously without disagreeable effects. The author believes that the theory that the disease may be contracted by chewing straws, grasses, etc., is not well founded as from a clinical standpoint this hypothesis does not fit the clinical history. Regarding treatment, the author says: "In evaluating any treatment for actinomycosis one must not overlook the fact that certain infections tend to recover spontaneously, particularly those involving the face and neck. For many years potassium iodid has been considered a specific for the disease. But the drug has proved disappointing in many instances and has frequently failed to check the condition. Even in very large doses it has had no effect on the course of severe injections. Harbitz and Grondale showed that potassium iodid up to 2 per cent strength in culture media failed to inhibit the growth of *Actinomyces bovis*. Probably the benefit seen with the iodids is simply from their action in aiding the absorption of inflammatory tissue. As a result of this loss in confidence in the iodids a multiplicity of remedies have been put forward recently, among them being methylene blue, copper salts, roentgen ray, radium, and arsphenamin. Many cases have been reported in which vaccine therapy, using a specific vaccine of killed actinomyces fragments, seemed of definite value. In one of the patients reported here it is of interest to note that the condition did not respond to potassium iodid by mouth, or x-ray therapy, combined with surgical drainage of the abscesses, but when the iodid was given intravenously signs of iodism disap-

peared and the condition improved. Following nonspecific protein therapy, that is, the typhoid, paratyphoid alpha and beta vaccine intravenously, the condition responded quickly with a complete disappearance of all evidence of the disease. There has been no recurrence. The most effective therapeutic regimen in the type of actinomycosis under discussion probably consists in the use of potassium iodid to tolerance, surgical drainage of the abscesses, small doses of roentgen ray, and the use of foreign protein therapy."

Salivary Secretion and the Intake of Fluid: Experiments were conducted by W. Horsley Gantt (*Am. J. Dis. Child.,* June, 1929) to determine whether thirst bears any relation to the secretion of saliva. The author outlines the method of experimentation as follows: The experiments were done under three sets of conditions: (a) with normal intake of fluids, (b) with forced intake of fluids and (c) with the production of thirst by a withholding of all fluids for twelve hours. In each case, the child was given an ordinary breakfast at 9 a. m., and experimentation was begun three hours later. With breakfast, the child received about 1,000 c.c. of liquid, and when the intake of fluid was forced the child drank as much as from 2,000 to 3,000 c.c. When the fluid was withheld and thirst became great, it was difficult to get one of the children to accept salt herring, though she ate lemon with avidity. A suction cup was applied over the opening of the parotid gland or of the submaxillary glands, respectively, and the saliva was collected in a graduate. The conditioned reflex was measured after showing the food to the child for thirty seconds, and again after one minute, and then the food was immediately given to her to eat. She was directed to chew on the side of the mouth from which the saliva was being collected, as it has been noted in this laboratory that the secretion is greater on that side. The collection was made from the submaxillary glands on both sides, as their openings are close together. Twenty grams of each of various foods were given to the child to eat and so timed that it was well chewed and swallowed during the course of three minutes, and the saliva was measured for each minute. The foods employed were: dry bread crumbs, ham, salt herring and lemon cut in slices; these were administered at intervals of ten minutes. As regards the parotid secretion, with each food taken there was a marked diminution of secretion in the case of thirst. The secretion on a forced intake of fluid was only slightly more than on a normal intake. Secretion from the submaxillary gland was found to be much lessened during a deficient intake of water. The experiments conducted with four different foods and with both the parotid and the submaxillary glands prove that the intake of fluids bears a definite relation to the quantity of saliva secreted. This fact is in agreement with that previously shown for the glands of the stomach, and may probably hold for all the glands of external secretion. It is therefore of prime importance for digestion that the fluid intake be sufficient.

MISCELLANY

BOOK REVIEWS

Teeth and Jaws Roentgenologically Considered. By Herman A. Osgood, M.D. Annals of Roentgenology. A Series of Monographic Atlases. Edited by James T. Case, M.D., Ex-President of the American Roentgen Ray Society. Volume Five. Second edition, revised. 419 illustrations. Price, $10.00. Published by Paul B. Hoeber, Inc., New York City.

The publisher and author of this book have gone to great expense to produce something out of the ordinary, and the result is an unusual production of rare excellence. There are 135 pages of text and bibliography and the remainder is made up of exceptionally fine plates.

The author treats his subject from the point of view of the medical man rather than of the dentist, though he quotes quite extensively from dental sources. As one would naturally expect, he has taken a conservative position in such subjects as the pulpless tooth, and also on curetment after extraction.

In some of the details, a dentist might well wish to modify his statements, but the teaching as a whole is orthodox and reliable.

The mechanical makeup of the book is beyond all praise and the publishers are to be congratulated. We have seldom seen better type or paper and the workmanship of the volume is in a class by itself.

The Basic Principles of General and Oral Pathology. A Textbook for the Dental Hygienist and the Medical Nurse; and a Supplementary Text for the Dental Student and the Graduate Dentist. By Lester Richard Cahn, D.D.S., Department of Oral Pathology, College of Dental and Oral Surgery, Columbia University. 89 illustrations; 152 pages. Price, $4.50. Published by Dental Items of Interest Publishing Company, Brooklyn, N. Y.

The author states that this book was written to supply the demand for a small textbook for dental hygienists and students. It is not so bulky nor so expensive as some of the more pretentious volumes on the subject, and it will appeal to many for this reason.

We do not recall having seen any other book on this subject, or in fact on any subject, that treats the various topics in such a terse and concise manner. There is no waste of words, and while this at times would seem to lead to a lack of comprehensive description, it is assuredly preferable to the verbosity that we find in some books.

This volume will well repay a careful reading, and it furnishes an admirable medium for reviewing quickly any of the subjects treated. We commend it highly.

The Pharmaceutical Recipe Book. First edition. By authority of the American Pharmaceutical Association. Prepared by the Committees on Recipe Book and on Unofficial Formulas of the American Pharmaceutical Association. Published by the American Pharmaceutical Association.

This is a book of 454 pages containing medical recipes of every imaginable variety. Naturally, the ones of greatest interest to the dentist are those on "Dental Formulas." These consist of dental creams, pastes, powders, mouth washes of all kinds, dentifrices, dental waxes and fillers, toothache drops, toothache paint, toothache wax, etc. Altogether there are thirty-four recipes which might appeal to dentists, and it is assuredly a convenient medium of reference to have this book at hand for immediate use at any moment. That the recipes are reliable is assured from the fact that the book is issued by authority of the American Pharmaceutical Association.

NEWS

Dr. Hanks Director of Hospital Dental Service: John T. Hanks, of New York City, has been appointed acting director of dental service in the new Department of Hospitals of New York. There are twenty-six institutions in the system, and this presents an unusual opportunity for linking up dentistry with medicine in a concrete and effective form. Dr. Hanks will be able, through this important office, to demonstrate the significance of dentistry, and prove to the various medical staffs that no hospital is complete today without an adequate dental service.

Death of Dr. Christopher: Carl John Christopher was born in Oslo, Norway, July 22, 1876, and died in Chicago, July 3, 1929. He was graduated from the Chicago College of Dental Surgery, class of 1902. He, with a partner, established a dental laboratory in Chicago under the name of Christopher and Golbeck. Dr. Christopher was president of the Dental Laboratory Association of Chicago and in this capacity he did much to stabilize the laboratory situation in this vicinity.

The Medical Center in Richmond: Announcement has been made of plans for the development of the medical center in Richmond at the Medical College of Virginia by W. T. Sanger, president of the institution. The work will probably cover a number of years. The first unit of the new center, a building for the college school of nursing costing approximately $300,000 for construction, equipment, and site, has been completed. The other units will go up as fast as funds, which are being sought in different directions, are available. Most of the ground to be used has already been acquired. The buildings projected are: 1. A library to be constructed in association with the library of the Richmond Academy of Medicine; to cost approximately $125,000. 2. A teaching unit to house the outpatient department and laboratories for the teaching of chemistry, bacteriology and pathology; to cost approximately $750,000. 3. A nurses' dormitory for the St. Philip Hospital school of nursing, an institution maintained by the college for negro girls; to cost approximately $150,000. 4. A building for clinical dentistry; to cost approximately $400,000. 5. A general hospital for white patients to be built in association with the outpatient department and teaching laboratories; to cost $1,000,000 or more. 6. A

gymnasium, auditorium and recreational center, cost undetermined. When this plan is carried through, it is hoped to provide dormitories for students in the schools of medicine, dentistry, and pharmacy.

Robin Adair School Completes First Year: Completion of the first year of work of the Robin Adair School of Oral Hygiene, formerly the Atlanta School of Oral Hygiene, was marked by commencement exercises, June 8, in the Assembly Room of the Atlanta Southern Dental College, John V. Pierson, director of the school presiding. Ralph R. Byrnes, executive dean of the Atlanta Southern Dental College, made the principal address of the evening. Diplomas were delivered to the fifteen young women making up the class, by Robin B. Adair, president of the board of trustees. Miss Cornelia Proctor, of Atlanta, president of the graduating class, read a history of the school, giving in outline the achievements of the late Robin Adair along the lines of preventive dentistry and the education of the dental hygienist. The school, which received its charter last October, grew out of private classes conducted as early as 1915 by the late Dr. Adair.

Dr. Lasby Made Dean and Dr. Vehe Promoted: William F. Lasby, who has been acting dean of the University of Minnesota, College of Dentistry, since the departure of Dean Alfred Owre for Columbia University, was recenty made dean. W. D. Vehe was advanced from associate professor to full professor in the dental college.

H. H. Johnson Retires: H. H. Johnson of Macon, Ga., has retired after forty-seven years in active practice. Dr. Johnson invented several widely used dental instruments, among them a lever rubber dam clamp, contouring pliers and a pneumatic mallet. He has been editor of various dental publications, a teacher of prosthetics, porcelain work and metallurgy, in the Atlanta Southern Dental College, member of the state board of dental examiners, president of the state society and a Vice President of the American Dental Association.

New York Passes Dental Laboratory Licensing Law: The Dental Laboratory Licensing Bill is now a part of the law of the State of New York. This act recognizes the intimate relationship between the dental laboratory and dentistry; raises dental laboratory work to the plane of a dignified calling, provides for the registration of dental laboratories and supervision of their conduct and sets forth definite requirements to be met by those who would enter the work as apprentices. Of equal importance is the fact that the law gives the qualified laboratory man a title—master dental technician.—*Bull. Indiana Dent. Ass'n.*

DEATHS

Brown, Peter J., Racine, Wis.; died, June 18.

Powell, T. E., Chicago, Ill.; Chicago College of Dental Surgery, 1893; died, June 25; aged 67. Dr. Powell was formerly professor of comparative anatomy at the University of Illinois. He is survived by the widow, four daughters and one son.

Quayle, Claire M., Denver, Colo.; Detroit College of Medicine, Department of Dental Surgery, 1901; died, March 15; aged 56.

Wagner, John L., Oak Park, Ill.; Northwestern University Dental School, 1898; died June 11, aged 59.

ANNOUNCEMENTS*

CALENDAR OF MEETINGS

NATIONAL SOCIETIES

American Dental Association, Washington, D. C., Oct. 7-11, 1929.

American Academy of Periodontology, Washington, D. C., Oct. 3-5, 1929.

American Dental Assistants Association, Washington, D. C., Oct. 7-10, 1929.

American Dental Hygienists Association, Washington, D. C., Oct. 7-11, 1929.

American Full Denture Society, Washington, D. C., Oct. 1, 1929.

American Society for the Promotion of Children's Dentistry, Washington, D. C., Oct. 10, 1929.

Association of American Women Dentists, Washington, D. C., Oct. 7, 1929.

National Association of Dental Examiners, Washington, D. C., Oct. 5, 1929. George L. Powers, Secretary, Memphis, Tenn.

STATE SOCIETIES

District of Columbia, at George Washington University, Washington, D. C., second and fourth Tuesdays in each month from October to June, inclusive.

April (1930)

Connecticut, at Stamford (22-24).

May (1930)

North Carolina, at Asheville (5-8).

Delta Sigma Delta Supreme Chapter, Washington, D. C., Oct. 7, 1929.

First District Dental Society of New York, Dec. 10-14, 1929.

International Dental Federation, Utrecht, Holland, Aug. 5-11, 1929.

Southwestern Dental Society, El Paso, Texas, October, 1929.

NORTH CAROLINA DENTAL SOCIETY

The next meeting of the North Carolina Dental Society will be held at Asheville, May 5-8, 1930.

DENNIS KEEL, *Sec'y-Treas.*

DELTA SIGMA DELTA

The Forty-Fifth Annual Meeting of the Supreme Chapter of Delta Sigma Delta will be held in the Willard Hotel, Washington, D. C., Monday, October 7. The annual banquet will be held at 6 p. m. in the Willard Hotel.

By order of the Supreme Chapter

JOHN P. BUCKLEY, *Supreme Grand Master,*
R. HAMILL D. SWING, *Supreme Scribe,*
226 S. 15th St.,
Philadelphia, Pa.

AMERICAN SOCIETY FOR THE PROMOTION OF CHILDREN'S DENTISTRY

The third annual meeting of the American Society for the Promotion of Children's Dentistry will be held, Thursday, October 10, at 12:30 p. m., in the Palm Room of the Mayflower Hotel. A cordial invitation is extended to all members and guests of the American Dental Association.

F. BLAINE RHOBOTHAM, *President,*
SAMUEL D. HARRIS, *Secretary,*
2002 Eaton Tower,
Detroit, Mich.

AMERICAN ACADEMY OF PERIODONTOLOGY

The annual meeting of the American Academy of Periodontology will be held at the Hotel Carlton, Washington, D. C., October 3-5.

CLAYTON H. GRACEY, *Sec'y-Treas.,*
269 Rowena St.,
Detroit, Mich.

CONNECTICUT STATE DENTAL ASSOCIATION

The next annual meeting of the Connecticut State Dental Association will be held at Stamford, April 22-24, 1930.

C. E. PETERSON, *Sec'y-Treas.*

*Announcements must be received by the fifth day of the month in order to be published in the forthcoming issue of THE JOURNAL.

BALTIMORE DENTAL COLLEGE—REUNION OF CLASS OF 1879

Members of the class of '79, Baltimore Dental College, are asked to drop a card to Franklin Bernard, 117 S. Broad St., Kennett Square, Pa., giving name and address.

DECEMBER MEETING FOR BETTER DENTISTRY, FIRST DISTRICT DENTAL SOCIETY, NEW YORK

The Fifth Annual December Meeting for Better Dentistry will be held at the Hotel Pennsylvania, New York City, December 10-14. As will be noticed, there will be an additional day of clinics and lectures this year. The list of essayists and clinicians is about ready and will be announced at an early date. The same plan of subscription will be continued this year, $5.00 admitting a member to all lectures, clinics, etc. A subscription blank and list of clinics will be ready for circulation, November 1.

There will be a manufacturers exhibit in the hotel during the meeting.

JOHN T. HANKS, *Chairman*

RAILROAD RATES TO WASHINGTON, D. C. CHANGE IN PLAN

The American Dental Association is discontinuing the use of the Identification Convention Certificate, and this year is using the "Certificate Plan." The certificates will be obtainable from your railroad agent, and NOT THROUGH THIS OFFICE. Full information will be sent to each member of the Association, giving dates of sale of tickets in all sections of the United States.

The following directions are submitted for your guidance:

1. Be sure that when purchasing going ticket you request a CERTIFICATE. *Do not make the mistake of asking for a "Receipt."*

2. Present yourself at the railroad station for tickets and Certificates at least thirty minutes before departure of train on which you will begin your journey.

3. *Certificates are not kept at all stations.* If you inquire at your home station, you can ascertain whether Certificates and through tickets can be obtained to place of meeting. If they are not obtainable at your home station, the agent will inform you at what station they can be obtained. You can in such case purchase a local ticket to the station which has Certificates in stock, where you can purchase a through ticket and at the same time ask for and obtain a Certificate to place of meeting.

4. *Immediately on your arrival at the meeting present your Certificate to the endorsing officer,* Harry W. Nelson, Vice-President, as the reduced fares for the return journey will not apply unless you are properly identified as provided for by the Certificates.

5. It has been arranged that the special agent of the carriers will be in attendance, October 7-11, from 8:30 a. m. to 5:30 p. m., to validate Certificates. If you arrive at the meeting and leave for home again prior to the special agent's arrival, or if you arrive at the meeting later than October 11, after the special agent has left, you cannot have your Certificate validated, and consequently you will not obtain the benefit of the reduction on the home journey.

6. Certificates issued to children at half fares will be counted the same as Certificates held by adults.

7. If your Certificate is duly validated, you will be entitled, up to and including October 15, to a return ticket via the same route over which you made the going journey *at one-half of the regular one-way tariff fare* from the place of meeting to the point at which your Certificate was issued.

8. Return tickets issued at the reduced fares will not be good on any limited train on which such reduced fare transportation is not honored.

9. *No refund of fare will be made on account of failure to obtain proper Certificate when purchasing going tickets, nor on account of failure to present validated Certificate when purchasing return ticket.*

CLINICS

at the

WASHINGTON MEETING

of the

AMERICAN DENTAL ASSOCIATION

Thursday afternoon and all day Friday

COLLEGE CLINICS SECTION CLINICS FOREIGN CLINICS
STATE ASSOCIATION TABLE CLINICS
STATE GROUP CLINICS

Fourth District Clinics on Friday afternoon

This group includes Delaware, New Jersey, Maryland, District of Columbia, Porto Rico, the Army, the Navy, the Public Health Service, the Veterans Bureau and the Bureau of Standards

FIVE HUNDRED CLINICS

Every phase of Dentistry will be covered

No practitioner can afford to miss these demonstrations, comprising a complete post-graduate course in every new development of dentistry
The usual clinic rules will prevail

Fred R. Adams, General Chairman of Clinics
8 West 40th St., New York City

H. A. Swanson, Chairman Clinic Group
Local Arrangements Committee

"Washington Promises the Greatest of Them All"

HOTELS	Rooms	Single with Bath	Double with Bath	Single without Bath	Double without Bath
BLACKSTONE 17th St., Btw. K. & L.	100	$3.00-5.00	$5.00-6.00		
BURLINGTON Vermont Ave. Thomas Circle	200	3.00-4.00	5.00-7.00	$2.50	$4.00
CAPITOL PARK N. Capitol & E.	150	3.00-4.00	4.00-6.00	2.00 up	3.00 up
CARLTON 16th & K. St.	260	5.00-7.00	8.00-12.00		
COMMODORE N. Capitol & F.	154	2.50-3.50	4.50-6.00		
CONTINENTAL N. Capitol & E.	250	3.00-4.00	5.00-7.00	2.00-2.50	3.00-4.00
DRISCOLL 1st & B. Sts.	200	3.50	6.00	2.00 up	3.00 up
EBBITT 1000 H. St.	150	2.50-3.00	4.00-5.00		
GRACE DODGE N. Capitol & E.	300	3.00-4.00	5.00-8.00	2.50-3.00	4.00-5.00
GRAFTON Conn. Ave., Btw. L. & N.	125	3.50-6.00	5.00-8.00	2.50-3.50	4.00-5.00
HARRINGTON 11th & E.	300	2.50-5.00	5.00-8.00	2.50 up	3.50-5.00
LAFAYETTE 16th & Eye Sts.	200	4.00-6.00	6.00-8.00		
MAYFLOWER Connecticut Ave.	650	5.00-10.00	7.00-15.00		
METROPOLITAN 6th & Pa. Ave.	175	2.50	4.00 up	1.50 up	3.00 up
POWHATAN Pa. Ave. & 18th	300	3.00-5.00	6.00-9.00		
RALEIGH 12th & Pa. Ave.	460	4.00-6.00	5.00-10.00	3.00-4.00	4.00-6.00
WARDMAN PARK Conn. Ave. & Woodley	400	uniform rate $5.00	uniform rate $8.00		
WASHINGTON Pa. Ave. & 15th	400	5.00-8.00	8.00-12.00		
WILLARD Pa. Ave. & 14th	475	5.00-10.00	7.00-15.00		
WINSTON 1st & Pa. Ave.	100	2.50 up	4.00 up	1.50 up	3.00 up

AMERICAN DENTAL ASSOCIATION

Washington, D. C. October 7-11, 1929.

HOTEL RESERVATIONS

In securing hotel reservations for the 1929 Session, consult the hotel rate-sheet and fill out the blank application below. Mail immediately to the hotel you wish to patronize. The hotel will then advise you of the reservation which they make for you.

In case your first choice cannot be made, indicate second and third choices. If none of your choices are available, the hotel manager will mail your application to the Chairman of the Halls and Hotels Committee and he will place your reservation in as favorable a hotel as possible.

Please remember that a reservation constitutes a contract with the hotel to provide you with the accommodations you desire. If you find it impossible to carry out your part of the contract, namely to occupy the room at time agreed on, please write or wire the hotel releasing it, in order that your room may be available for other members.

MAIL THIS APPLICATION DIRECT TO THE HOTEL

HOTEL RESERVATION

AMERICAN DENTAL ASSOCIATION, WASHINGTON, D. C., OCT. 7-11, 1929

.....Hotel. .....1929.
Washington, D. C.

Please reserve sleeping room accommodations as noted below:

.....room(s) with bath for .....people. Rate desired per day $.....

.....room(s) without bath for.....people. Rate desired per day $.....

Second choice hotel.....

Third choice hotel.....

ROOMS TO BE OCCUPIED BY:	ADDRESS IN FULL
Applicant.....	.....
....	.....
.....	.....
.....	.....

Please confirm this reservation to applicant. I further agree to notify the hotel at once in the event I am unable to use this reservation.

Important to Hotel Manager: In the event you cannot accept this reservation, please forward this application at once to Dr. R. L. Morrison, Chairman Halls and Hotels Committee, Suite 706, 1103 Vermont Ave., N. W., Washington, D. C., who will attend to the assignment of this reservation.

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1929

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